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BIRD-BANDING

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BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XVIII JANUARY 1947 No. 1

A STUDY OF THE MATING OF THE COMMON TERN (*STERNA H. HIRUNDO*).[1]

BY OLIVER L. AUSTIN, M.D.

Fifteen years ago, incident to seasonal studies carried on by the Austin Ornithological Research Station in the Cape Cod, Massachusetts, colonies of nesting *Sterninae*, minor occurrences, such as the repeated occupancy of isolated sites by one or two pairs, suggested that mating might not be a casual affair with all pairings being made annually, uninfluenced by preceding alliances. As, through the following years, the behaviour pattern of this species was revealed with progressive clarity, particularly its most fixed and important trends, there gradually developed a concept that many Common Terns remain mated over a considerable part of their life span. In fact, it became increasingly apparent that most of the more important known habits could not function if an extensive, seasonal interchange of mates occurred. Accordingly, measures were instituted for the acquisition of data which might make possible a fairly correct evaluation of this theory.

For four years, 1943 through 1946, field work was carried on in the Cape's colonies of breeding terns for the identification of mated pairs, and their recapture following seasons. This work yielded the records of 122 known mated pairs of which one or both members nested from two to four different seasons during this interval. These pairs nested a total of 272 times, 215 with the mating unchanged, 57 with the substitution of a new mate. Consequently, 79.1 percent of the time there was a persistence of the original pairing from one season to the next. There were eight instances when only one member of the original pair was retrapped the second year, the same bird being caught again the third year but with a new mate. Since it is not known whether the new alliance was formed the final or the intervening year, to avoid uncertainty, the eight have not been included in the total of 215. Their addition would raise the foregoing percentage to 81.9. This high rate appears to warrant the postulation that Common Terns tend to remain mated from year to year. While the totals on which this inference is

[1]Contribution number 42 by the Austin Ornithological Research Station.

based are small by comparison with the large aggregate from which other behaviour habits of the species have been deduced, the affirmative percentage is higher. For that matter, subsequent analysis of several thousand returns did not alter materially conclusions which had been drawn from a mere twenty-nine returns by O. L. Austin, Jr. (1929).

It is not known precisely at what age, when or where Common Terns choose their mates but prolonged observation appears to show that the pairing of at least a majority of the component individuals antedates the arrival of a colony at its nesting site. The first comers show a definite, though not comprehensive, alignment into *pairs*. This arrangement continues in evidence during the early actions of the flock: while they are idling along the shore lines, during their innumerable flights over the ternery and while they are making visits to suitable terrain for the purpose of selecting nesting sites. Sixty-seven years ago William Brewster (1879) wrote: "A few days after the advent of the Little Strikers [Least Terns] . . . the Wilson's (Common) and Roseate begin to appear. They are already mated." Similar observations have led more recent investigators to believe that some terns were mated prior to their return and to surmise that sometimes mating continues unchanged from year to year (Marples, 1934: 63-107, Palmer, 1941: 35-63). These writers, however, appear to think that a relatively large number of single birds select mates after they have reached the terneries. Also that to this end, unmated individuals resort to what has been designated "courtship behaviour." The term courtship comprises "nuptial flights," "posturings," play of various sorts with a fish as the toy, making scoop holes and other procedures. Issue is taken with that opinion. Aside from collecting, the only satisfactory evidence of mating is finding two identified individuals, and no other bird, incubating a specific clutch of eggs. Further, it should not be assumed that a bird unaccompanied by another even the greater part of the time is unmated; conclusive findings to the contrary are available. Until two individuals known beyond doubt to be unattached are found mated subsequent to their exhibition of courtship behaviour it can be stated only theoretically that this behaviour influences mating. Far less justifiable is an assumption that a bird exploiting it is unmated. Unquestionably courtship behaviour is an essential prelude to copulation, much in evidence not only during the first part of a nesting but also when a considerable number of frustrated birds are about to lay second clutches. Much better is considering courtship behaviour a misnomer in the absence of an explicit statement that its definition does not apply to an initial formation of at least a seasonal partnership.

It has been shown (Austin, 1940: 162; 1945: 25; 1946: 24) that the individuals comprising the Cape Cod group of terns tend to maintain, from year to year, the same alignment into colonies, also that each of the colonies is inclined to return seasonally as a unit to the site it had

occupied the preceding year. From this there are always deviations, sometimes minor, occasionally extensive. As a rule they are due to yearly variations in the topography and ecology of the terneries; at times they result from exigencies of diverse sorts; occasionally they are of unknown causation. As a rule, such divergences are only seasonal; there is always a definite trend, in following years, toward a resumption of the original colonial affiliations and site occupancies. Further, many individuals return habitually from season to season to renest in the same sector of a ternery.

For the purpose of orientation concerning this particular behaviour, the exact location of 176 nests on Tern Island was determined by measurements made from permanently placed markers. The birds occupying these nests were trapped and identified. The findings were recorded on a map drawn to scale. The following years this same part of the ternery was retrapped thoroughly; all nests were located and mapped in the same manner; the band numbers of the tenanting birds were determined and recorded. In addition, the same procedure was duplicated in other sectors of the island until data relating to 835 nests had been obtained. The details and results of this undertaking have not yet been published but it was found that not only had a considerable percentage of the birds returned to the close vicinity of their former occupancies but even that several had relocated within a foot or two of their previous sites.

Necessarily, the following research was based on the capture of mated pairs and their identification with numbered Fish and Wildlife Service bands. This procedure was simplified by the fact that the Common Tern, aside from its predominant habit of colonial nesting, is absolutely non-communistic in all its breeding activities. In 1943, on that part of the old and very large rookery at Tern Island, where the terrain was essentially of the type known to be preferred by this species, a quadrat seventy-five feet square was marked out with stakes. This tract was selected because it was known to be tenanted largely by older and consequently more stably behaved members of the colony. The quadrat was subdivided equally into sixteen smaller squares. On May 24th when the preponderance of the birds already had selected nesting sites and when egg laying was well under way, a blind was erected on an unoccupied place near the middle of one boundary. As completely as it was found to be possible, all birds nesting within the quadrat or in its immediate vicinity were trapped and banded, their nest sites mapped and the identifying band numbers recorded. To facilitate the recognition of these birds in this and future years, and particularly to increase the likelihood of recapturing any which, consequent to frustration, might renest elsewhere on Tern Island or in a different ternery, a colored celluloid band was affixed to each left leg. (This Station applies all Service bands to the right leg.) The same procedure was carried out on a small, ovoid hummock or islet, fifty-four by twenty-seven feet in

size, fifty feet west of the island's upland and elevated about three feet above the surrounding marsh. This second site was selected because it has been always more closely tenanted than any other part of Tern Island and for the reason that, like the quadrat area, the majority of its occupants were relatively older birds. Also it had excellent natural boundaries.

At the close of the season it was found that the usual thwarting and renesting had taken place. Doubtless some of this was consequent to the great amount of continuous time it was necessary to spend in the quadrat and close to the islet in order to complete the capture of both members of some pairs. In 1943 nine color banded individuals were retaken at Tern Island or in other colonies; four of these individuals constituted two pairs mated as they had been in the initial attempt. It is a suggestive fact that not once during the four years of study was a renesting bird retaken the same year with other than its original mate for the year.

In 1944, the quadrat and islet were worked exactly as they had been the preceding year. In addition, a second quadrat, fifty feet square, was laid out one hundred yards distant from the first. This and a second islet, smaller and fifty feet away from the first hummock were utilized similarly. The complete frustration and wholesale dispersal of the Tern Island colony coincident with hatching (Austin, 1946), brought this work to an abrupt and premature close. To offset this and establish an extensive foundation for a continuation of the investigation subsequent years, throughout the remainder of the season, at Tern Island and in the other colonies as well, much time was devoted to the capture and color banding of mated pairs. The numbers of the Service bands and the colors of the celluloid bands were recorded but not the exact location of the nests in the terneries. From the inception of this study bands of a different color were used in each of the experimental tracts and rookeries.

Identical field work for the acquisition of data was carried out in 1945 and 1946. The results, by reason of such serious obstacles as shortage of personnel and erosion of parts of both quadrats, were far less voluminous than had been anticipated and desired.

Incident to the large scale adult trapping this station carries on each season in all the colonies, it is not unusual, especially when only part of a clutch of eggs has hatched, to take mated pairs under a trap. All pairs caught were given celluloid bands and included in the totals. Whenever in the course of this routine work a color banded bird was taken, persistent efforts were made to determine its mate.

The following table, number 1, correlates and totals the takes of known mated pairs. While most of the data were secured at Tern Island, the small percentages acquired elsewhere are included in the totals without segregation according to sites.

TABLE NUMBER 1

Year	Nests, Mated Pairs and Single Member of Pairs Identified			Individuals Taken			Banding Status of Birds Taken	
	Nests	Pairs	Singles	Pairs	Singles	Total	Returns	Unbanded
1943	176	134	42	268	42	310	199	111
1944	835	566	269	1132	269	1401	840	561
1945	109	57	52	114	52	166	135	31
1946	155	104	51	208	51	259	174	85
TOTAL	1275	861	414	1722	414	2136	1348	788

The capture of mated pairs proved to be an arduous, tedious, often impossible task particularly in the matter of securing all birds nesting in the quadrats or on the islets. Even more difficult was the locating and trapping of the pairs which returned subsequent seasons to nest outside the experimental areas or in other than their original terneries. Most troublesome and least productive were efforts to recapture both members of pairs renesting the same season. The total of known pairs could have been increased to considerable numbers, as was done in 1944, by retrapping repeatedly nests located indiscriminately through the rookeries using from thirty to eighty traps simultaneously. The percentage of recoveries found to accrue subsequent years was too insignificant to warrant repeating the procedure. Several handicaps impeded the work, some of considerable magnitude; a few were obvious, others were learned by experience. The aggregate of these was sufficient to account for the comparatively small quantity of data obtained in return for the amount of time spent in their acquisition.

Always about one-third of the tenants of the quadrats and islets were taken promptly with the automatic traps this station employs for routine adult trapping (Austin, 1938: 17). Many more could have been caught with an automatic trap devised by station personnel a few years ago. It captured every bird which returned to a nest over which it had been placed, but after a few days its use was discontinued for it frequently broke eggs or injured birds. So, for securing the remaining two-thirds, it was necessary to resort to drop traps operated by pull strings manipulated from a blind or some nearby cover. This is slow, time consuming work for not more than ten such traps can be managed properly at one time. Often even this was futile; in 1943 only one bird was taken from each of thirty-three of the one hundred and twenty-five nests in the quadrat, twelve of the fifty-three nests on the islet, a failure of 25.5 percent. Some birds would never return to a clutch partly covered by a trap of any sort but would resume incubating soon after the trap had been removed. Also, after the application of variously colored bands had made possible the sight identification of individuals, it was observed that with surprising frequency the greater part of incubation was carried on consistently by one member of a pair. Often a

tern would not walk under a trap unless its mate was present and patently encouraged the act. One occupant of a nest within a few feet of the blind was taken fourteen times before its mate was secured.

Meteorological conditions determined the extent of each day's accomplishment as the amount and consistency of incubation essential to the welfare of the eggs is governed by the temperatures of both the air and the ground. The degrees of these are varied considerably, with the presence or absence of sunshine and the direction of the wind. Observation has shown that a colony incubates more intensively on either very hot, calm days or when a strong, chilling wind blows in from the ocean. Conversely, the many cool, balmy days usual on the Cape in June, reduced the takes to much below the average. High winds interfere with successful trapping in other ways than by lifting the traps from the supporting sticks. When they occur, the colony is always jumpy and wild, the birds covering their clutches for shorter periods at a time and taking much longer than usual to walk to their nests after having alighted—as almost always they do—a few feet away. Of course field work is impossible when it rains, when there is dense fog, even when the terrain is more than a little damp.

Since the only practical method of capturing breeding terns is based on the necessity of their incubating their eggs, obviously the degree of success attained in adult trapping is in direct relation to the degree of assiduity with which incubation is carried on. It has been found, after due allowances have been made for all other known influences, and in spite of unalterable biological necessities, that closeness of incubation varies along fixed lines during the whole incubation period. It is exceedingly casual until complete clutches have been laid; it becomes stabilized at what appears to be an adequate amount until three or four days before hatching begins. Then there is an abrupt change; almost constantly either one or the other adult covers the nest until the last chick has emerged. It was during these last few days that the greatest success was attained in completing the capture of pairs. In the quadrat in 1943, the second member of three pairs was never seen on its nest until the first chick had hatched.

The presence of people always disturbs a ternery and curtails incubation, although to a much less degree in a large colony such as Tern Island or at a closely tenanted site such as Bird Island. One individual, working alone on the capture of pairs, resulted in far less inhibition of nesting activities than occurred when two or more people carried on together. The first month this particular work was done demonstrated that almost always for about one hour the take of birds would be good, dwindling rapidly the second hour, with only an occasional take made in the third. This pointed out plainly that the safety of clutches required limiting the presence of a worker in one of the experimental tracts to seldom more than two consecutive hours.

Reaction to intrusion, like all items of tern behaviour, varies in individual birds, some tolerate it to an incredible degree, others react immediately and drastically to very little of it. In 1943 two pairs never returned to their clutches in the quadrat after the first member of each had been trapped and banded; both these color banded birds were taken later the same season on new nests elsewhere on Tern Island. The occupants of a nest one yard distant from the blind were seldom away from it in spite of the presence of a worker; on another clutch only five feet beyond the opposite side of the blind no bird was ever seen, yet all three eggs in the clutch hatched.

The average incubation period for the Common Tern is 25.7 days with a maximum of 30 (Austin, O. L., Jr., 1932: 127). Over the years it has been found that at Tern Island site selection and egg laying regularly take place about one week earlier than they do at other sites. Excepting in an abnormally late season, in this rookery the great preponderance of laying has been completed by the first of June. Also it is known that the older members of the flock make site selections and deposit their eggs in advance of their younger associates. To prevent interfering with the acquisition of territories, it was expedient to delay trapping until the major part of the colony had become well established in their chosen domains. Table number 2 shows when the taking of pairs began each year, it being noted that in 1944 an exceptionally large colony nested at Tern Island more than a week earlier than usual. (Austin, 1946: 11).

Lest some of these dates suggest inconsistency, it must be stated again that the quadrats and islets were known to be tenanted largely by older members of the colony.

TABLE NUMBER 2

DATES WHEN TRAPPING BEGAN EACH YEAR

	In Quadrats	On Islets
1943	May 28th	June 10th
1944	May 26th	May 31st
1945	June 12th	June 8th
1946	June 3rd	May 31st

It is apparent that three, at most four weeks is the total period of time over which the taking of pairs from the initial nesting could be carried on with reasonable profit. Even less time was available for locating and identifying throughout all the colonies birds known to have had membership in recognized pairs preceding years. Every season, from time to time, even up to mid July, new nests were found in all the experimental areas. However, the Station's records show that almost one-half of the occupants of these late nests were—comparatively—very young birds; of the remainder, many proved to be renesting individuals taken earlier in the same year in other sectors of Tern Island or even in a different ternery, Plymouth in particular.

The loss of bands, not only the colored celluloid ones of which the durability had been untested, but even the numbered metal Wildlife Service bands was found to be much larger than had been suspected. The celluloid bands, at the time of their application the same size as the number three Service bands used for terns, deteriorated rapidly. Some unrolled so quickly that they dropped off a few days after they had been affixed. This amounted to a loss the same season of nearly five percent, between ten and twenty percent the following one; only two or three percent survived two years wear. As a result, the identification of a number of birds which had been members of established pairs preceding years could be made only by checking their Survey band numbers on prepared lists of the birds found mated during previous nestings. So doing added no great difficulty to work in the experimental areas but it was far too time consuming to warrant continuing to do it for all banded birds taken during the routine trapping of the remainder of Tern Island and the other sites.

Of greater moment was the disappearance of numbered Service bands. In the belief that, with wide exceptions both ways, the average number three bands, when applied to terns, last for ten years, it is routine for this station's field workers to replace all bands in service for that length of time, also all others showing excessive wear. The last two seasons, 1945 and 1946, it was found that the recent series with the key numbers forty, forty-one and forty-two were much softer than their forerunners, many of them having been so thinned by two years of wear that substitution was necessary. Solely from impressions received during many years of work in tern colonies, it had been suspected that some of the new adults trapped from time to time were individuals which had lost their previously applied bands. In 1944, two birds were trapped, each wearing one of the comparatively short lived celluloid bands but both without the Service bands which they were carrying when the former were affixed; eight such were taken in 1945; four in 1946. Of the thirty-seven color banded terns trapped elsewhere than in the experimental areas in 1945, six, or seventeen percent were found to have lost their Service bands. It cannot be doubted that the loss of bands of one type or the other reduced considerably the total recaptures of identified pairs.

The high death rate of the birds selected for this investigation by reason of their average advanced age, lessened very much the possibility of their being recaptured in nestings subsequent to the first. In a former contribution (Austin, 1942), the rather short life span of the Common Tern was shown to be only ten years and graphs demonstrated that approximately five-sixths of a colony disappear between their fifth and eighth years of age at definite rates. The best sample to which the foregoing facts can be applied as a measuring stick in estimating the number of mated pairs likely to return consists of the birds comprising the

pairs taken in 1943. Of the three hundred and ten, roughly one-third or one hundred and eleven were unbanded leaving one hundred and ninety-nine to whose ages there was some clue. Of the one hundred and ninety-nine, thirty-eight were banded while chicks and the average of their exactly known ages is 5.8 years, 7 for the islet birds, 4.7 for those from the quadrat. The average period of survival of the birds banded as adults, from the time of their original capture until they were retaken in the experimental tracts, had been 3.6 years. It having been shown that less than ten percent of the Cape's terns breed until their third year of life (Austin, 1942: 168), the probable age of the adult banded birds was 6.6 years when they became identified with this study. So, in spite of possible variables it is safe to assume that the average of all the three hundred and ten individuals, including the newly banded, was 6.0 years. Graphs 2 and 3 in the contribution referred to show that these birds may be expected to disappear during the next three years at rates shown in table number 3.

TABLE NUMBER 3

RATE OF DISAPPEARANCE OF ADULTS AT SEVERAL AGES

	Banded as Chicks	Banded as Adults
Between the sixth and seventh years	33.8 percent	63.3 percent
Between the seventh and eighth years	41.2 percent	12.5 percent
Between the eighth and ninth years	5.9 percent	12.5 percent
Total	80.9 percent	88.3 percent

Even allowing the wide margin of ten percent for possible error, it appears the number of pairs available for recapture decreased annually to an important extent.

The amount of time it was possible to devote to this special study was curtailed greatly by other activities it was inexpedient to forego. For instance, much field work was required to prevent the occurrence of any hiatus in the trapping of adults and the thorough chick banding this station has carried on for the past eighteen consecutive years in all the Cape colonies, always more comprehensively at Tern Island than elsewhere. In particular, the attention it was possible to give to finding returned color banded birds nesting at large in the terneries was exceedingly inadequate. Although from one-tenth to (in one instance at Tern Island) one-half of the adult population of all the colonies was trapped, even this afforded only a small chance of securing the desired birds. Certainly efforts to capture all mates with pull string traps was out of the question.

In planning this study of mating, great store was placed on the known trend of Common Terns to return yearly to the site of their former tenures. While this trend contributed much to what was accomplished, its functioning was inhibited greatly, even thwarted at times, by mishaps which befell Tern Island. Not only were important ecological desiderata

altered seriously but even former nesting sites were destroyed. A history of the practically complete frustration of this colony in its initial 1944 nesting has been published (Austin, 1946). The mass emigration to other sites for renesting which followed—the usual sequence to a major catastrophe in a tern colony—resulted in the departure of most of the pairs recognized the preceding year before they could be trapped. However, a number were taken a little later in other rookeries, one pair at Tern Island sixteen days after it had been trapped near the second quadrat at Tern Island. In mid July there was extensive renesting on Tern Island. During this, of the pairs identified in 1943, two were taken on the islet, another four feet from the site it had occupied in June, and a single member of six pairs in various parts of the rookery. In September, the same year, a severe storm with a gale of wind at the time of high course tides, eroded extensively one shore of the island, washing away one-fourth of the first and one half of the second quadrats. In 1945, early in the third week of May, the colony was twice the size it had been at the same time other seasons but during the ten succeeding days, for some unknown reason, there was an exodus of two-thirds of these birds to nest elsewhere. In the fall of that year, dredging operations deposited mounds of sand over much of the area where many pairs had been taken in July, 1944. In April, 1946, after the island had been given its annual clean-up, a storm piled up so much debris on both the islets that almost no nesting territory remained. In addition, an overgrowth of beach grass in another fourth of the first quadrat and in the greater part of what remained of the second, made this terrain unappealing to nesting terns.

These several handicaps which have been discussed in detail in conjunction with others not mentioned, limited to one hundred and twenty-seven the number of pairs retaken in years subsequent to their primary identification. In the three years 1943, 1944 and 1945 a total of seven hundred and fifty-seven pairs were taken. Of these, ninety-nine were recaptures once or twice of pairs taken seasons before, reducing to six hundred and fifty-eight the total of known pairs. Of this last number the one hundred and twenty-two retaken any one of the years 1944, 1945 and 1946 constitute 18.5 percent, roughly one of every five. While this is a rather small sample, it is believed that attempts to obtain a larger one would have been too difficult, impracticable and inimical to the welfare of the colonies. Since no modifying data would be likely to accrue from continuing a follow-up of the already identified pairs, unfortunately, further study must be made from a fresh start.

The records and all the tabulations amassed during this investigation are too voluminous to warrant publication. Accordingly, with much care being taken to exclude all uncertainties but to include all findings which might contradict what the final evaluation appears to show, the end results are condensed and amalgamated into tables 4, 5 and 6.

TABLE NUMBER 4

ALL THE MEMBERS OF IDENTIFIED PAIRS recovered with the same or a new mate any subsequent year. The table shows the year of original identification, the years in which one or both members were retaken also the number of pairs in each classification.

Same mates 1943 and 1944	39
Same mates 1943, 1944 and 1945	1
Mated in 1943, neither taken in 1944, same mates 1945	1
Same mates in 1943 and 1944, one new mate in 1945	4
Mated in 1943, one with new mate in 1944	17
Mated in 1943, both with new mates in 1944	1
Mated in 1943, one taken in 1944, same mates in 1945 and 1946	2
Same mates in 1943 and 1944, one taken in 1945, same mates in 1946	2
Mated in 1943, one taken in 1944 and 1945 and with a new mate in 1946	1
Same mates 1943 and 1944, one taken in 1945 and with new mates in 1946	1
Same mates in 1943 and 1944, neither taken in 1945, one with new mate in 1946	2
Same mates 1943, 1944 and 1945, one with new mate in 1946	1
Same mates 1944 and 1945	12
Same mates 1944, 1945 and 1946	3
Mated in 1944, one taken in 1945, same mates in 1946	4
Mated in 1944, neither taken in 1945, one with new mate in 1946	3
Mated in 1944, neither taken in 1945, same mates in 1946	1
Mated in 1944, one with new mate in 1945	14
Same mates in 1945 and 1946	5
Mated in 1945, one with new mate in 1946	2
Mated in 1945, both with new mates in 1946	2
Five birds numbered 1, 2, 3, 4 and 5, mated in the following combinations:	
1943 1 and 2	
1944 1 and 3 also 4 and 5	
1945 2 and 4	
1946 2 and 5	4
Total number of mated pairs of which one or both members were retaken following years	122

TABLE NUMBER 5

PATTERNS OF CONTINUED AND NEW MATINGS by banded pairs of terns retrapped in seasons subsequent to year of original capture. Table shows year of first identification, status of mating each following season, and the number of pairs in each classification.

x—Member of original pair. n—New mate.

Class I Pairs with complete records of identical matings.

1943	1944	1945	1946	No. of pairs
xx	xx	xx		1
	xx	xx	xx	3
xx	xx			39
	xx	xx		12
		xx	xx	5
Total				60 pairs

Class II Pairs with incomplete records, but which were identically mated at last trapping, and therefore may be presumed to have maintained original mating throughout.

1943	1944	1945	1946	No. of pairs
xx	x	xx	xx	2
xx	xx	x	xx	2
xx		xx		1
	xx	x	xx	4
	xx		xx	1
Total				10 pairs

Class III Pairs of which one member *only* was recaptured with new mate. Failure to capture the other member of the original pair may indicate in each case that the new mating resulted from the death of the original mate.

1943	1944	1945	1946	No. of pairs
xx	xx	xn		4
xx	xn			17
xx	x	x	xn	1
xx	xx	x	xn	1
xx	xx		xn	2
xx	xx	xx	xn	1
	xx	xn		14
	xx		xn	3
		xx	xn	2
Total				45 pairs

Class IV Pairs of which *both* members were retrapped with new mates.

1943	1944	1945	1946	No. of pairs
xx	{xn {xn			1
		xx	{xn {xn	2
Total				3 pairs

Class V A unique group of matings in which five birds nesting close together in one of the quadrats interchanged mates each year. The combinations were as follows:

1943—Birds 1 and 2.
1944— " 1 and 3; 4 and 5.
1945— " 2 and 4.
1946— " 2 and 5.

Since the members of the original pairs are involved in four different matings, they are counted as 4 pairs

Grand total ..... 122 pairs

TABLE NUMBER 6

ANALYSIS OF TABLES NUMBERS 4 AND 5

Mating status of 122 pairs recaptured following years

Same mating all years	70	57.4 percent
New mating	52	42.6 percent
	122	100.0 percent

One or both members of original pairs were taken 272 times:

Same mating

Same mating continued in all captures	205 times
Same mating continued after an interval of one year in which neither was taken	2 times
Same mating after one year in which one member was taken	8 times
Same mating continued	215 times
	79.1 percent

New mating

New mating on each return	54 times
One member taken with new mate after an interval of one year in which neither of original pair was taken	3 times
Mating changed	57 times
	20.9 percent

Years mating continued with no change of mates

Number of Years	Number of Pairs	Percent of Pairs Taken	Percent of Pairs Banded
Two years	56	45.9	8.8
Three years	10	8.2	1.5
Four years	4	3.2	0.6
	70	57.3	10.9

Number of years mating continued with no change or until a new mate was taken

Number of Years	Number of Pairs	Percent of 122 pairs retaken
Two years	63	51.6
Three years	11	9.0
Four years	4	3.2
	78	63.8

Number of years one or both members of original pairs were taken

Number of years	Number of pairs	Same mating	Percent same mating is of pairs
Two years	96	63 times	65.6
Three years	18	11 times	61.1
Four years	9	4 times	44.4
		Average for the three	57.0

Relation of returned mated pairs to mated pairs identified (See table 1)

Number of pairs captured in 1943, 1944 and 1945	757
Number of pairs recaptured in 1944, 1945	99
Total number of new pairs	658

122 pairs recaptured is 18.5 percent of identified pairs.
122 pairs recaptured total of 151 times 19.8 percent of all pairs captured.

To show the effect of increasing age and deteriorations in environment on the number and percentage of recaptures

	Identified in 1943 134 pairs		Identified in 1944 566 pairs		Identified in 1945 57 pairs	
Returned in 1944	57	42.6 percent				
Returned in 1945	7	5.3 percent	27	4.4 percent		
Returned in 1946	10	7.5 percent	12	2.0 percent	9	15.9 percent

These tables show that in eighteen instances one or both members of a pair were not taken in the year intervening between their first capture and their subsequent recovery with or without a change in the mating. For statistical purposes—and to be on the safe side—it has been assumed that the eight times birds of this group were taken with a new mate after the lapse of a year or more, the new alliance was in existence the intervening year. Conversely, it has been thought proper to consider there had been no interruption in the mating of the other ten pairs during the interregnum. In justification it may be stated that no mating was found ever to have been resumed subsequent to its dissolution.

The last items in the tables four and five show an involved interrelationship of five individuals during the four year period which cannot be interpreted with unquestionable satisfaction in spite of several excellent clues. Bird number 1 disappeared the third year; number 3 was taken only once; number 4 appeared the third and fourth seasons; number 5 was trapped the second and fourth; number 2, a member of the original pair, was taken every year excepting the second. All five were of mature age, number 2 being seven years old in 1943, the first year. Each had been taken as a return at least once prior to 1943. All nests concerned were in the same eighteen feet square subdivision of the first quadrat. Every one of the clutches was laid early in the nestings. Four things are suggested as having some possible bearing on the incident: first, close association of the individuals and propinquity of their nests for several successive seasons; second, the not impossible continuation of the same group adherence on the wintering grounds; third, failure of one or more of the birds to breed by reason of a temporary inadequacy of gonadal development and stimulation; last, a rare deviation from the known anti-communistic behaviour of the species even though no tern has ever been seen incubating more than momentarily, eggs not its own. However, since these five birds constituted only 1.7 percent of the two hundred and ninety-two known members of the one hundred and twenty-two recaptured pairs, and especially because only one incident of the affair is known to have been duplicated, it appears justifiable to consider the melange solely another one of the inevitable divergences from any behaviour pattern and of no other significance.

Five times both members of previously mated pairs were retaken with both members of all pairs allied to new mates; two of the five were involved in the incident discussed in the preceding paragraph. The five represent 4.1 percent of the one hundred and twenty-two pairs, approximately one of every twenty-five. In only two of the new pairings which resulted had the new partner been a member of a pair found mated any preceding year and in both cases the previous mate of the newly acquired partner was never retaken. Certainly these five vagaries, of which the causation is not even suspected, are too small a percentage of the pairs

known to have done otherwise to militate against considering the existence and potence of a behaviour habit.

Correlation of data has resulted in findings which assist in recognizing the purport of the field work. There were fifty-two ultimate returns of members of pairs with new mates, 48 times—a little more than one-third of the total one hundred and twenty-two returns—by only one member of the original union. Never were any of the first mates of the forty-eight retaken in any of the terneries. As a rule, birds selected for mates individuals from the same era of the life span as their own (Austin, 1942). Constancy of mating was greatest the first season after the initial capture and diminished with increasing rapidity each following year. Longer continuation of matings and by a higher percentage was evidenced by pairs tenanting the first islet and two particular subdivisions of the first quadrat than by those taken from other portions of Tern Island. All pairs retrapped while renesting the same season, even on a different site, had continued the original matings.

It is believed that the contents of the foregoing tables are sufficient substantiation of the postulate expressed at the beginning of this article to consider continuity of mating from year to year not only a trend but even an important part of the behaviour pattern of the Common Tern. Any act which is repeated more than half the time by a majority of a group of individuals should be considered a habit. All percentages in the table meet this requirement with more than ample margins. Certainly four years is a sufficient amount of time to preclude the possibility that these figures may have been raised above their normals by the sum of intercurrent variables. Rather, it is not improbable that the series of mishaps at Tern Island lowered the percentages by preventing the recapture of many of the pairs most likely to have remained mated. No trend in tern behaviour is followed consistently by all individuals for so unfortunate an event is not compatible with the degree of virility and adaptability possessed by the species. From the most compelling of all trends, colonial nesting, there are always many digressions even to the point of frequent isolated nestings by single pairs. Likewise, the percentage of individuals failing to follow the potent proclivity to group adherence and site tenacity equals if it does not exceed the percentage of birds which do not remain mated.

It may be objected that the sample obtained is too small and not representative. However, the two hundred and ninety-two birds which at any time were members of the one hundred and twenty-two pairs, amount to at least one thirtieth of the average population of Tern Island during the four year period. Also, careful and detailed analysis obviates the necessity for the data being more numerous. It is true that a more diversified selection could have been made particularly in respect to age, but the use of a preponderance of middle aged individuals with well developed habits was intentional. Such birds would not have the

instability of youth nor the unadjusting persistence which is usual in old age for the potency of a behaviour trait increases with age (Austin, 1945). After all, middle aged birds always constitute the vast majority in all tern colonies. Thus it is reasonable to contend that the trend under discussion characterized the behaviour of the Tern Island colony as a whole. A previous contribution (Austin, 1940) has shown that behaviour traits function in all other Cape colonies quite as they do at Tern Island with the exception of such minor deviations as are necessitated by variations in the ecology of the several nesting sites. Consequently, it is believed that a trend toward continued mating governs the entire Cape group. That this applies to the species as a whole is solely an unproved assumption. Albertsen (1943) announced the recapture in Helgoland of two pairs of Common Terns mated exactly as they had been two years before. Aside from this there is no known report of any duplication of this study elsewhere in the breeding range.

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BLACK DUCK BANDINGS AT THE AUSTIN ORNITHOLOGICAL RESEARCH STATION *(continued)*

BY JOSEPH A. HAGAR

PART IV

RECOVERIES OF SUMMER-BANDED BLACK DUCKS

There is an impression current among waterfowl banders, not usually formulated in exact terms but still rather widely held, that ducks banded on the breeding grounds either as juveniles or adults have a special value in determining the routes and other characteristics of migration. Like many another idea which takes root gradually without the benefit of critical examination from time to time, this has elements of sound truth, but is sometimes given a more general application than the facts warrant. Let us consider briefly its relation to Black Duck banding.

Looking at it first as an abstract theory, we may suspect that one reason for its origin and growth is the mere fact that so much of the sum total of banding has been done among the juveniles of colonial-nesting birds—gulls, terns, and herons, for instance. Since recoveries from these groups run above the average, it follows naturally that more is known about the movements of birds so banded than about species which do not lend themselves to mass operations on the breeding grounds; and from such data, there is an obvious temptation to generalize.

The real strength of the theory lies in the fact that all juvenile-banded birds have a known factor in their history—age—which is lacking for the great majority of birds banded by other means. Because any known factor increases the probability of correctly interpreting the data, birds banded as juveniles are to this extent more valuable than other banded birds. There is also a tendency for juveniles, because of high mortality during the first fall and winter, to supply a relatively large number of short-term recoveries, and these are useful not only for their volume, but because the more quickly a bird is recovered, the more safely it may be assumed that the route followed was direct.

Offsetting this latter advantage is the fact, now generally recognized, that young birds on first leaving their birthplace are likely to disperse in all directions, as if scattered by an explosion. It is supposed that some or most of them presently return to their hereditary range, but the final results of the process are much more obscure than the original scattering. In the meanwhile, recoveries of these juvenile vagrants at considerable distances from their starting point may unduly color the conclusions which we draw about the more stable adult population, and particularly if the adult population is essentially regional or inclined

to become sedentary. For example, it is clear from extended study of the Herring Gull that juvenile banding is the only approach to an understanding of the migration of young birds, but that adult trapping either at or away from the nest site would provide more quickly, and quite as accurately, the data necessary for general management of the breeding population.

Most of the game ducks, and specifically the prairie-breeding ducks, lend themselves at times to mass banding. Their breeding densities are often high, and when the cover is not too heavy, or in such exigencies as are caused by drouth, it has been possible to corral large numbers of young flappers for banding. Outbreaks of botulism have similarly facilitated the large-scale banding of adults. Released, both young and old are subject in varying degree to the advantages and disadvantages above-mentioned. Their mortality rate is exceptionally high because of shooting, which means that recoveries are numerous. The juveniles show the same tendency to erratic post-breeding-season dispersal as other birds, but the differences between the migrations of young ducks and old are apparently not great, so that vagrancy is less confusing in the records. There are, then, sound reasons for the belief that banding on the nesting grounds is the quick way to management data for most of the game ducks. It does not follow, however, that the same data cannot be obtained by alternative methods.

In the case of the Black Duck, the value of banding during the nesting season is not a material issue, because the opportunity for it scarcely exists. The bird is by nature a sparse and scattered breeder in relatively dense cover. The precocious young are so adept in avoiding capture that it is only occasionally possible to lay hands on two or three of a brood of flappers. The flightless adults in mid-summer are accomplished skulkers, by choice in brushy or wooded swamps; even a glimpse of one is exceptional. As a practical matter, and in terms of assembling a quantity of data within reasonable time limits, banding of Black Ducks during the breeding season is unprofitable. The nearest alternative is the trapping of moulted birds as soon as possible after they regain the power of flight, and if the recoveries are closely analyzed, the resulting data are quite as useful.

The Austin Station, in comparison with other banders, has been unusually successful with such post-moulting operations. Ducks originally banded in July and August make up more than 10% of the 5,515 bandings at the Station proper. In five years of the twelve, the percentage runs from 25% to 35%. Moreover, the timing of these big years is favorable; four of them were consecutive from 1934 to 1937, and thus prior to the intensive mid-winter trapping beginning in 1938, and the fifth was a check-up in 1941. In proportion to the number of Blacks on Cape Cod in July and August, the sample is as satisfactory as for any season of the year.

The recoveries from these birds agree in some respects, and in others disagree, with the usual ideas of Black Duck migration. On the whole their distribution is surprisingly similar to the distribution of recoveries from all Cape bandings. For these reasons, and particularly because they are the equivalent of nesting-season bandings for the other game ducks, it seems appropriate to analyze them as a unit, and to fill in the pertinent data rather fully.

DESCRIPTION OF DATA

A total of 572 Black Ducks have been banded by the Austin Station in July and August, all in the Dike Meadow traps.

With the exception of a single duck on the 18th, the July trappings were confined to the last week of the month. Grouped into 10-day periods, 14% of the total were banded on or before July 31, 14% between August 1 and 10, 38% between August 11 and 20, and the remaining 34% between August 21 and 31. The downward trend of the final period continues into September, and when the records are examined in detail, it appears that the only years in which September bandings exceeded those of August (see Table I, *Bird-Banding*, 17, no. 3, p. 108) were the years when operation of the traps was delayed or intermittent at the start of the season.

Putting all this another way, experience has shown that if the Blacks using the Dike Meadow are thoroughly trapped up before August 20, the number of additional new birds which will arrive before the middle or last of September is comparatively small. This fact, it seems to me, is of considerable significance in fixing the source of these summer-banded ducks on Cape Cod itself. Some of them may be from farther south, but the total cannot be large or there would be more southern recoveries after banding. It is hardly possible that any of them come from farther north, because the nesting season and therefore the moult are progressively later in the summer in that direction. Finally, the gathering of these ducks at the Station coincides very closely with the time when local-raised Blacks are known by specimens to be completing their wing-moult, and are more commonly seen at twilight and dawn passing to and from their feeding grounds. I conclude, therefore, that the bulk of these summer birds must have nested or been raised not very far away, and that it is the upswing in the number of new birds in the traps during the last half of September, after a distinct lull of three or four weeks, which signifies the arrival of the first migrants from the Maritime Provinces.

Looking now to the recoveries from these 572 Blacks, the records show that 34 of them have been killed away from Cape Cod—24 north of Massachusetts, four south, and six on the mainland of the state itself not very far from the coast. Table IX classifies them by place and term

TABLE IX

RECOVERIES OF BLACK DUCKS BANDED JULY-AUGUST AT AUSTIN STATION

Place of recovery	Recovered same fall	Recovered in later seasons	Total recoveries	% of banded birds recovered
Northward:				
Maine	4	4	8	
New Brunswick	2	5	7	
Pr. Edward I.	—	1	1	
Nova Scotia	—	4	4	
Quebec	1	2	3	
Ontario	1	—	1	
Total north	8	16	24	4.2
Southward:				
Long Island	1	—	1	
New Jersey	1	1	2	
Virginia	1	—	1	
Total south	3	1	4	0.7
Massachusetts:				
North and northwest of Station	1	1	2	0.3
West and southwest of Station	3	1	4	0.7

of recovery, and in the last column, computes the rate of recovery for each major group. It will be seen at once that the northward rate of recovery, 4.2, is very nearly the same as for all Cape-banded birds (Table IV, *l.c.*, p. 113), but the southward rate, 0.7, is a full third less than for all birds (Table VIII, *t.c.*, no. 4, p. 151). The ratio of same-season southward recoveries to those of later seasons is 3 to 1, a normal relationship in the circumstances, but almost the reverse of the ratio for all southward recoveries (*l.c.*, p. 148). Note also that eight of the 24 birds recovered north of Massachusetts were killed during the same autumn in which they were originally banded.

In the text figure on page 23 these recoveries of summer-banded Blacks are plotted in diagrammatic form, with symbols for same-season, first-spring, and later-season records. Several further points are thus thrown into relief:—first, the same northeast-southwest trend noted previously for all Cape-banded ducks; second, the fact that the point of mean dispersion for later-season recoveries lies well to the east of that for same-season records; and third, the rather remarkable recovery from Fort Chimo, Ungava.

Taking table and diagram together, it appears that the recoveries from these summer-banded Blacks fall into three categories which are important enough for separate discussion.

SAME-SEASON NORTHWARD RECOVERIES

The complete records of the eight same-season recoveries north of Massachusetts, and of the one bird killed on the mainland, are as follows:

BANDED:	RECOVERED:	
1. 1935—Aug. 15; 2 rpts. to Aug. 25	Nov. 26	Kingston, Ontario
2. 1936—July 23; 1 rpt. July 25	Sept. 15	Fredericton, N. B.
3. 1936—Aug. 4; 3 rpts. to Aug. 9	Oct. 20	Central Cambridge, N. B.
4. 1936—Aug. 18; 1 rpt. Aug. 21	Sept. 6	near Montreal, Quebec
5. 1936—Aug. 31	Oct. 23	Jonesport, Maine
6. 1937—July 29	Oct. 29	Wakefield, Mass.
7. 1937—July 29	Oct. 13	Bath, Maine
8. 1937—July 30; 1 rpt. Aug. 7	Oct. 30	Blue Hill Bay, Maine
9. 1941—Aug. 21; 2 rpts. to Aug. 29	Oct. 6	Boothbay Harbor, Maine

In addition to this list, the Austin files contain a few instances of ducks banded after September 1 which supplied same-season recoveries to the north. Strictly speaking, they are outside the scope of this section, but since they, too, may be of Cape origin, and in order to have the whole picture of erratic migration at once, it seems proper to introduce them, parenthetically, at this point. Three of them, recovered in Nova Scotia in mid-winter, have already been discussed in another connection (*t.c.*, no. 3, p. 120). Five others are as follows:

BANDED:	RECOVERED:	
1. 1932—Oct. 11	Oct. 22	Mt. Desert, Maine
2. 1932—Oct. 24	Oct. 26	Merrymeeting Bay, Maine
3. 1932—Oct. 24	Nov. 25	Swan Island, Maine
4. 1932—Oct. 25	Nov. 5	Brunswick, Maine
5. 1940—Oct. 12	Oct. 16	Ipswich, Mass.

Finally, there is the unique case of a duck trapped at the Station in five out of six years, but finally recovered at the end of a vagrant flight 70 miles west-northwest. It was first banded September 17, 1933 and repeated eight times to November 22; returned September 23, 1934 and repeated once on October 31; returned September 9, 1935 and repeated on October 8 and November 29; returned November 9, 1937 and spent the winter to January 24; returned August 11, 1938; and was killed at Needham, Massachusetts, October 28, 1938.

Perhaps the first thing to say of these records is that, although they fail of really prime significance, they are extremely interesting. They invite long speculation as to why and how they were made.

Did the Kingston, Ontario, bird originally go northeast to New Brunswick and thence, in the course of three months, drift southwest up the St. Lawrence to the point of capture? Did the Montreal bird, with a 16-day interval between banding and recovery, go more directly? Why

was dispersal, with the exception of these two ducks, so narrowly north-northeast? What was the extent of the association between the two ducks which were in the trap together on July 29, 1937, and were then recovered 16 days apart at Bath, Maine, and Wakefield, Massachusetts; did they leave the Cape separately, or were they together in Maine, and the second return to Wakefield after the first was killed? The 1932 recoveries suggest a substantial movement from the Cape, and yet what were the real relationships, for the Mt. Desert duck was dead before the other three were banded at the Station? Incidentally, was there any connection between these Maine birds and the fact that a duck which was with them in the trap on October 24 was killed at Provincetown on October 27—one of only seven same-season recoveries on the Cape north of Wellfleet during the whole twelve years of banding?

These are only six of the many questions that come to mind as you study the records. In the end it is not possible to pick out any important pattern, for the details of these recoveries are more erratic than orderly. They confirm the existence of post-breeding-season dispersal from Cape Cod, but here, unexpectedly, they have one aspect of regularity at the very point where by theory they should be random, for their distribution is strongly directive, toward Maine and central New Brunswick. On the evidence of the 6-year-old Needham recovery, vagrancy is not confined to young birds, and the recoveries in late fall and early winter, particularly in Nova Scotia, introduce the possibility that it goes on sporadically during a considerable part of the year.

Yet because it is erratic, and lacks volume, it cannot be considered important.

LATER-SEASON NORTHWARD RECOVERIES

In contrast to the group of records just discussed, the noticeable characteristic of the 16 later-season recoveries north of Massachusetts is their conformity. There are none from Newfoundland, but with this exception, their distribution is very much the same as for all northward recoveries (Map I, *t.c.*, no. 3). The parallel includes even the bird first banded on the Cape in August, and recovered from a muskrat trap at Central Blissville, Sunbury County, New Brunswick, on April 28 of the following spring.

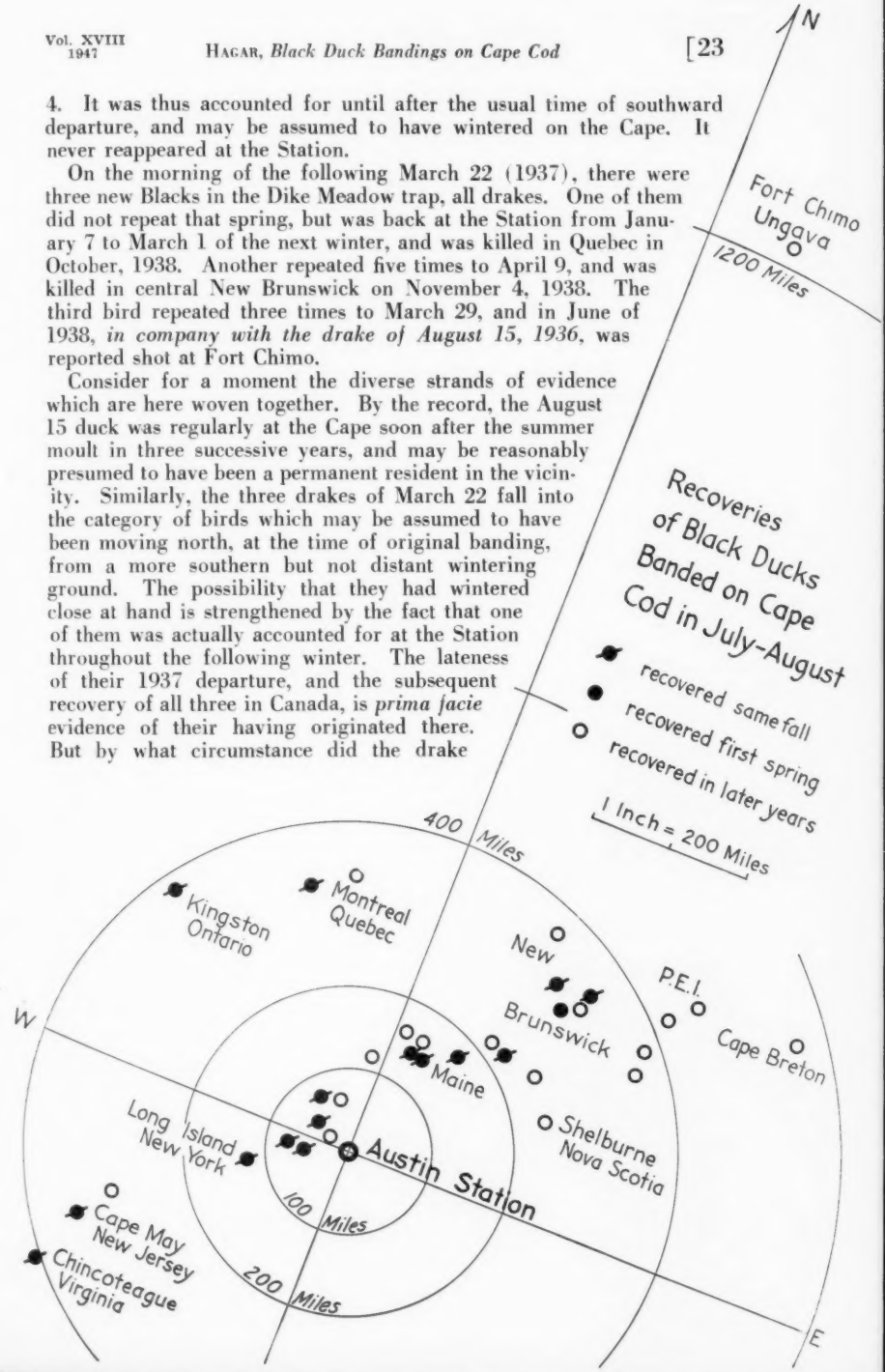
The Fort Chimo record is worth giving in full, not only for its immediate interest but because it is so good an example of the striking contrasts which appear among these summer-banded Blacks.

On August 15, 1936, there were only two new birds in the Dike Meadow trap, a duck and a drake. The duck was not retaken that season, but made single reappearances in the same trap on August 25, 1937 and August 11, 1938. The drake, following a different pattern, was in the traps 22 times during the autumn, with the last entry on December

4. It was thus accounted for until after the usual time of southward departure, and may be assumed to have wintered on the Cape. It never reappeared at the Station.

On the morning of the following March 22 (1937), there were three new Blacks in the Dike Meadow trap, all drakes. One of them did not repeat that spring, but was back at the Station from January 7 to March 1 of the next winter, and was killed in Quebec in October, 1938. Another repeated five times to April 9, and was killed in central New Brunswick on November 4, 1938. The third bird repeated three times to March 29, and in June of 1938, *in company with the drake of August 15, 1936*, was reported shot at Fort Chimo.

Consider for a moment the diverse strands of evidence which are here woven together. By the record, the August 15 duck was regularly at the Cape soon after the summer moult in three successive years, and may be reasonably presumed to have been a permanent resident in the vicinity. Similarly, the three drakes of March 22 fall into the category of birds which may be assumed to have been moving north, at the time of original banding, from a more southern but not distant wintering ground. The possibility that they had wintered close at hand is strengthened by the fact that one of them was actually accounted for at the Station throughout the following winter. The lateness of their 1937 departure, and the subsequent recovery of all three in Canada, is *prima facie* evidence of their having originated there. But by what circumstance did the drake



which was first trapped at the Station on August 15 turn up at Fort Chimo, the northernmost point of recovery for Cape-banded Black Ducks?

There are two major possibilities. This August bird may have been adult in 1936, and merely failed to go north at the usual time. Or it may have been actually raised on the Cape, and during its first winter have formed a sufficiently strong association with ducks of Canadian origin to go north with them in the spring.

Any conclusion is speculative, but the second alternative is not improbable, and in fact is considerably strengthened by the number of other later-season records from eastern Canada. If true, it would supply an adequate explanation of the fact that summer-banded Blacks from the Cape, in spite of the mortality from shooting during their first autumn, still have a rate of later-season northward recovery which approaches that of birds banded in the dead of winter after the shooting season is over.

SOUTHWARD RECOVERIES

The southward recoveries of summer-banded Blacks—four outside of Massachusetts, four more in Plymouth and Bristol counties—are too few in number to need much comment. The six same-season records have already been cited (*l.c.*, no. 4, pp. 154 and 156, and Map III). The two later-season recoveries were both from 1941 bandings; the first, trapped August 4, was shot in October, 1943, at Plymouth, and the second, trapped August 29 and repeating at the Station until January 22, was killed on the New Jersey coast in mid-October of the next year. For all eight, the pattern of distribution is essentially the same as for other southern recoveries.

I have shown previously (*l.c.*, pp. 153 and 157) that the volume of southward migration is to be gauged not only by the number of actual southward recoveries, but by the number of banded ducks which are retrapped on Cape Cod after the close of fall migration—*i.e.*, after December 1 of a normal year. Applying this second test, it appears that summer-banded Blacks have much the same winter distribution on the Cape as all Blacks. Of the 572 birds in the summer sample, 24% were recorded in the traps at the Station proper during some part of their first winter. For the 138 birds banded during August, 1941, the figure was 36%. These percentages, by the experience of trapping operations in Nauset marsh and Pleasant Bay, mean that the bulk of the sample still alive after the shooting season may be presumed to have wintered within a 15-mile radius south and southwest of the Station.

Not only is their distribution similar, but these ducks show behavior patterns which are identical with those of fall and winter-banded birds. The most casual reading of the records is enough to supply evidence of

this. For example, the summer ducks fall into the characteristic patterns of repeating at the traps:—a few are regular boarders, some repeat irregularly and at considerable intervals, others disappear soon after their original banding but come back at the close of the shooting season, while still others, never recorded during autumn and winter, reappear for a few days in February or early March in the customary mode for ducks which are known to have wintered at Nauset or Brewster, and are on their way north. Again, some of the summer-banded ducks which return to the traps the second and third seasons arrive in early August, but a surprising number show up for the first time in October and November, as if they were coming in with the new birds from the Maritime Provinces.

These are small things by themselves, but in the long run they point strongly to the conclusion that the summer-banded ducks are wintering on the Cape, and acting like an integral part of the whole population.

The sparsity of southward recoveries carries an important implication with respect to post-breeding-season dispersal. Since the rate of southward recovery for summer-banded birds is even lower than for all birds, it is impossible that any substantial number of ducks raised on Cape Cod are making a vagrant migration to the north and presently returning to a more southern winter range. They may return to the Cape itself without being distinguishable in the records, but for them to go farther south would raise their recovery rate above that for birds banded at all seasons.

The point may be carried a step further. Theoretically, the rate of southward recovery for summer-banded ducks should be higher than that for all birds, because it must cover both random post-breeding-season dispersal and true migration. Since it is actually lower, we have one more bit of evidence that in this particular case summer dispersal is not random, and that Black Ducks trapped on Cape Cod in August are, if anything, somewhat more sedentary than those trapped in fall and winter.

CONCLUSIONS

Looking back, now, to weigh the broad trend of the evidence, it appears that the real significance of the returns and recoveries from these summer-banded Black Ducks lies in their close similarity to the returns and recoveries from all the Blacks banded on Cape Cod at any season.

Northward vagrancy is a conspicuous factor with these birds because of its imaginative appeal, but it is clearly too limited in volume and reach to have major importance. Whatever purpose it may serve, few

ducks go beyond the limits of their regional group, and even these are presumably compensated by similar movements from other regions. Vagrancy is therefore a minor consideration in local or regional management, which must deal with the main body of a population rather than its erratic offshoots.

Aside from vagrancy, these Black Ducks banded in summer show the same patterns of recovery northward, southward, and on the Cape itself, as all Cape-banded Blacks. This is certainly important. A sample of six hundred ducks is too small by itself to serve as the basis for any sweeping conclusions, but when it is as compact as the one in hand, and proves on analysis to show much the same trends as a larger sample previously analyzed, each set of findings reinforces the other.

In the present case, the recoveries from these summer-banded ducks are the third and final indication that on Cape Cod we are dealing with a regional maritime population of Black Ducks having its principal affiliations to the northeast in Canada.

(To Be Concluded)

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TWO NATIVE BIRD TRAPS OF PANAMA

By MICHAEL J. TAKOS

Two kinds of traps are frequently used for capturing small birds in the Republic of Panama. Honey creepers, finches, tanagers, parakeets, and some members of the oriole family are taken in these devices for sale as cage birds. The most common type, called the *tapa* (meaning lid or cover), is found in practically every village throughout the Isthmus. The *churuco* (stirrup) is used principally by the natives of Colon Province, although it is known, at least by name, in other regions. Both models are light, compact, simple to operate, and could be modified very easily for use at bird-banding stations in the United States.

The *churuco* and *tapa* are constructed from the wood of a species of palm (*Bactris minor* Jacq.), called *caña brava* (wild cane) in the Republic, and no metal fasteners are employed. The heavy members of the traps, such as the framework, are fashioned from sections of cane poles about 1¼ inches in diameter. These pieces are lap-jointed at all corners and the members pinned together with small dowels. An arrangement of parallel bars, set perpendicular to the framework, encloses the cage. The bars are cut from sections of cane and placed into holes bored through the heavy frame members. Each bar is about

1/10 of an inch in diameter and they are spaced at approximately ½ inch intervals. The over-all dimensions of the traps may vary with the size of the birds to be captured, however, they are usually built 8 inches high, 11 inches wide, and 16½ inches long.

The *tapa* and *churuco* are divided into an upper and a lower compartment by a series of bars. Small doors are provided through the walls of the traps so that birds can be removed from these chambers. The lower compartment always houses a bait bird, while the upper contains the capturing mechanism. The cageling is usually a female of the species desired and serves to lure the wild males into the trap. Never-

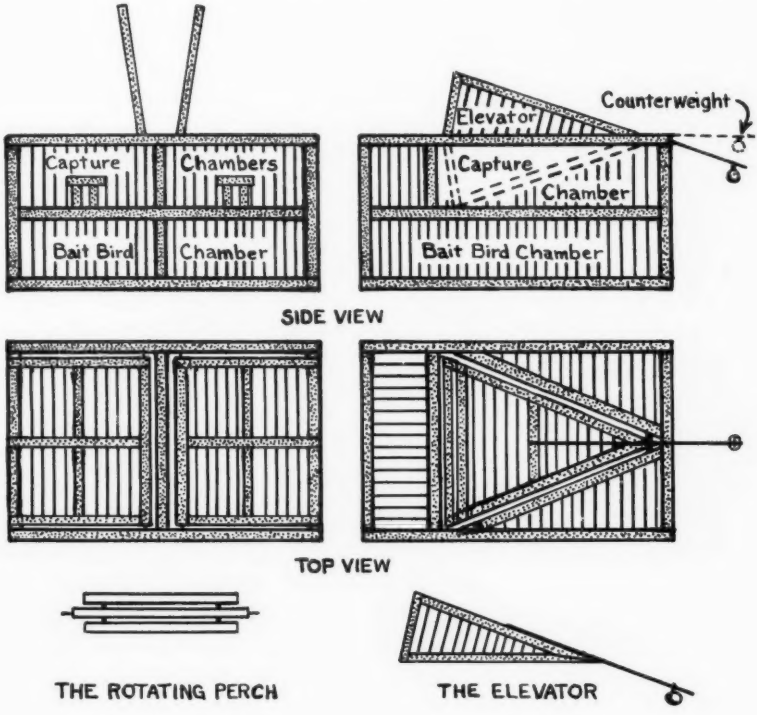

Fig. 1 Scale drawings of the *tapa* and *churuco* showing details of construction.

theless, bits of banana or other fruits are always used as bait in addition to the caged bird. The traps are hung among the branches of trees near banana plantations or other localities where fruit is plentiful. Trapping is usually done by small boys who visit the traps to remove the newly captured individuals and to feed and water the bait bird.

THE TAPA

The upper half of the *tapa* is divided into two capture compartments which are open at the top. These openings are closed by doors that swing on pins set near the top center of the trap. The doors are always

FIG. 2 The *tapa* with one compartment in the set position.

weighted with small stones or bits of metal to make them close rapidly. The capturing mechanism depends on a rotating perch device. A piece of cane, which turns on pins running through the sides of the compartment, serves as the axle of the perch. Two pieces of cane are fastened parallel to the axle in outrigger fashion, and are so balanced that the slightest weight on either outrigger will rotate the entire structure. When the trap is set, a sliver of cane props open the door; the lower end of the prop rests on the axle of the perch. A bird alighting on either outrigger will rotate the perch, thus sliding the prop from its resting place on the axle and allowing the door to close. One bird can be captured in each compartment before the trap must be reset. (figures 1 and 2).

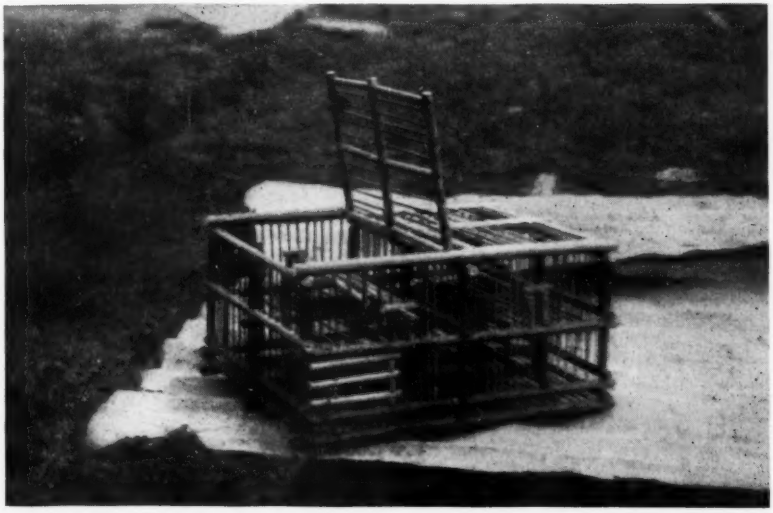

FIG. 3 The *tapa* showing details of door giving access to the bait bird chamber.

THE CHURUCO

Because of its self setting mechanism, the *churuco* is a more complicated trap. It consists of three parts; a bait bird chamber, the capture compartment, and the active capturing element, here called the "elevator." This element is built in the form of a hollow, elongated pyramid which is open at the base. The pyramid reclines on one side at the top of the trap, the latter being fashioned so that the bottom of the elevator closes the capture chamber. The entire device swings on a pin set through the pyramid near its apex and is supported by the roof of the trap. Therefore, the elevator can swing an arc either by dropping until the lower edge of the base touches the floor of the capture room or by rising until the lower side of the pyramid is flush with the top of the trap. A counterweight is attached to an arm extending from the elevator and keeps it in balance at the last mentioned position. This balance is upset when a bird enters the open base of the elevator, and the added weight causes the device to swing down into the capture compartment. The bird eventually finds its way into the capture room by squeezing through a space appearing between the wall of the chamber and the base of the pyramid. Thus relieved of the extra weight, the elevator is lifted by the counterweight to its original position and the trap is ready for the next visitor. There are small projections jutting

from the lower edge of the base of the pyramid in order to keep the momentum from lifting the elevator out of the trap. It is not at all unusual to take as many as seven birds in one afternoon with this trap. (See figure 1.)

A modified kind of *tapa* or *churuco* could be made by using heavy gauge wire for the framework and covering it with screening. The framework would probably be unnecessary if ½ inch mesh, zinc-coated screening were used. Canaries might be utilized as bait birds, but this feature of the traps could easily be dispensed with. Most bird-banding enthusiasts can probably think of a number of ways to change the traps to adapt them to local conditions. It is hoped that these ingenious devices may find some place among the capturing equipment of bird-banding stations.

Emory University, Georgia

GENERAL NOTES

Longevity record for the Common Tern.—June 24th, 1946, Common Tern carrying band number 550611 was trapped on a nest at Tern Island, Chatham, Cape Cod, Mass. Since this bird was an adult when banded by Charles B. Floyd at Tern Island, July 4th, 1927, it is at least twenty years old, possibly more. Eighteen years was our preceding record.—O. L. Austin, Austin Ornithological Research Station, North Eastham, Massachusetts.

The Return of Young Robins to their Birthplaces.—Donald S. Farner's article: "The Return of Robins to their Birthplaces," Bird-Banding 16: 81-99, July, 1945, presents a valuable discussion of the tendency of young Robins and other passerine birds to return to their birthplaces for future breeding. Dr. Farner points out that it has not been determined whether this tendency is associated with the birthplace itself or actually with the last place occupied prior to migration. He cites Nice and Hickey as presenting some evidence that the latter hypothesis is valid.

In 1930, I was attending the Winnwood School, Lake Grove, Long Island, New York, which is three or four miles north of Lake Ronkonkoma and about fifty miles east of New York City. One of my teachers found a pair of juvenile Robins *(Turdus m. migratorius)* on the ground, and asked me to try to raise them to prevent cats from killing them. One of the birds died that evening, but the other, a male, grew healthily. He had the freedom of my room, and was able to fly about in it by the end of May. He was completely tame, so much so that when I tried to release him outdoors he would not fly away, but returned to my shoulder. I decided to keep him to show to my mother, and in June we carried him in a cage to my home in Passaic, New Jersey, fourteen miles west of New York City. There I had him banded by a neighbor, and released him in our garden. At first, he would return to the house to be fed, hammering on the windows to attract notice; but in a few weeks he learned to forage for himself. He always flew to my shoulder when he saw me during the summer, but in September he disappeared, doubtless migrating south with the other Robins.

The next spring, I saw him frequently in Passaic, and on a few occasions he came to me and let me pick him up, although he was less tame than he had been.

He had a special chirp which he appeared to use only for my benefit. In the autumn he disappeared again. I began banding operations myself in Passaic in 1932, and caught this robin several times that year, although he was much wilder. My banding records are not now available to me, but my recollection is that I caught him again in 1933 and that I thought I recognized him in 1934.

This unintentional experiment suggests that the factor determining the return of young robins to their natal sites is basically the fact that their birthplaces are the places from which they leave for their first migration. Passaic is about seventy-five miles west of Lake Grove, which is probably farther than normal competition or other natural factors would force young birds to range from their birthplaces to find nesting sites. I wrote to Dr. Farner about this incident, and it is at his suggestion that I am publishing this note.—FRED MALLERY PACKARD, National Parks Association, 1214 Sixteenth Street, N.W., Washington, D. C.

Further Data on a One-Eyed Robin.—In BIRD-BANDING of January, 1946, (17(1): 38), an account appears of a one-eyed Robin *(Turdus migratorius)* that returned to my banding station for three seasons. He had been banded in October, 1941, in normal condition but returned in 1943 with the loss of his right eye. After occupying the garden for nesting, he disappeared in July, 1945, and I did not expect to see him again. But, on December 27, 1945, he and his mate of the previous summer reappeared at the banding station. They were recognized immediately by their colored bands and their habits.

During the winter of 1945-46, uncountable thousands of Robins occupied an immense roost in Nashville. During the day, they spread out in great flocks over the surrounding area and spent most of their time in the hackberry trees, consuming the abundant crop of fruit that had matured that year. Each time that raisins were placed on the feeding ledge and thrown to the driveway, all the feeding Robins scattered at the slam of the casement window, except One-Eye and the green-banded female. To them, the noise was a signal that a favorite food was available and they immediately flew to the house.

Although the pair had reappeared on the same day and used the same area they had occupied as nesting territory the previous summer, he spent most of his time on the portion to the west of the house and she used the part to the north. He made attempts to defend one hackberry tree (near the house), flying at the Robins that invaded it. There were fights over raisins btween resident Mockingbirds and both One-Eye and the female. I saw two fights between the pair; on January 21, 1946, the fight was already in progress when observed but on January 25, One-Eye was the aggressor. He flew at her, she reiterated, then a prolonged fight ensued, but both remained to eat raisins after these encounters.

In late February, One-Eye was also spending considerable time on the north lawn as if he would claim spring territory as last year. On March 19, the pair fed together, but on the 21st, she was showing some dominance. While feeding, he warily grabbed a raisin and ran, with the female running at him, but he returned to feed with her. Unfortunately the very interesting observations ended on March 24, when the slightly mutilated body of One-Eye was found on the north lawn, the victim of a neighborhood dog. Sight identification was verified by his bands. The injured eye had dried and had sunk deeply into the socket. He had survived at least three full years after the loss of his right eye, nesting in summer, migrating two autumns when the other Robins left Nashville, and coming back to winter during the period of the large Robin roost here. Having hatched in 1941 or earlier, he was at least approximately five years old. His mate was not seen after his disappearance.—AMELIA R. LASKEY, Graybar Lane, Nashville 4, Tennessee.

An Interesting Recovery of a Banded Gray Jay.—On 6 August, 1946, an adult and a young Gray Jay, *Perisoreus canadensis griseus* Ridgway, were obtained on the summit of the Cascade Divide about one and one-eighth miles southwest of Annie Spring at about 6,250 feet. These birds were from a family group

of at least three, which, at the time, were traveling westward at an approximate rate of two miles per hour through a rather dense stand of Mountain Hemlock, *Tsuga Mertensiana* (Bong.) Sargent, in the manner characteristic of this species of jay in late summer. One of the specimens, University of Kansas Museum of Natural History Number 23499, had on its leg Biological Survey band number A283458. Mr. F. C. Lincoln kindly supplied the information that this band had been issued to Mr. W. T. Frost, formerly of the ranger staff of Crater Lake National Park. According to Mr. Frost's data this Gray Jay was banded as an adult at Annie Spring on 27 December, 1937. It was retrapped nine times on that day and four times on the following day. A yellow band was placed on its leg for sight identification. This yellow band had been lost by the time of the above described recovery. This recovery is of interest not only because of the age of at least nine years attained by this bird but also because of its proximity at the time of recovery, one and one-eighth miles, to the banding locality.—D. S. FARNER, Museum of Natural History, Lawrence, Kansas.

A White-throated Sparrow Return.—On October 26, 1946, I retrapped in our garden at 29 Chestnut Street, Salem, Massachusetts, a White-throated Sparrow (*Zonotrichia albicollis* (Gmelin)) banded No. A150515 at the same spot by me on December 16, 1945. The bird was in a plumage intermediate between the winter or immature and adult when banded and was in adult plumage when retrapped. This example had not been trapped by me from the time it was banded until the return record was made. As only one other of this species was banded in the fall of 1945 and none until this autumn of 1946, this represents a fifty per cent return ratio of birds banded the preceding season. The return bird is undoubtedly a winter resident in the area.

Although this return offers no strikingly unusual features, owing to the relative scarcity of returns taken for this form, I have been advised to put it on record. I had a previous return for the species at the same spot some years ago.—BENJAMIN SHREVE, 29 Chestnut Street, Salem, Massachusetts.

RECENT LITERATURE

Reviews by Donald S. Farner and others

BANDING

1. Results of Bird-Banding Activities under the Auspices of the Rijksmuseum van Natuurlijke Historie te Leiden, XXIX. (Resultaten van het ringonderzoek betreffende den vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie, XXIX.) G. C. A. Junge. 1942. *Limosa*, 15(1/2): 19-27. This is a summary of bird-banding activities for 1941 including also a few previously unreported records from earlier years. Among the interesting records are those of ten Cormorants, *Phalacrocorax carbo sinensis* (Shaw and Nodder), banded during the breeding season from 1929 to 1937, all recovered at the banding locality during the breeding season of 1941. A Purple Heron, *Ardea purpurea* L., banded as a juvenile bird in Holland in June, 1935, was shot in Italy in March, 1941. A Moorhen, *Gallinula chloropus* (L.) was banded at Stein 2 February 1937, and was found dead at this locality 3 March 1941. Two Lapwings, *Vanellus vanellus* (L.), banded as young in 1938 and 1940 respectively were recovered at the banding locality during the breeding season of 1941. A Swallow, *Hirundo rustica* L., was banded as a juvenile bird at Voorschoten 4 August 1935 and recovered dead at Wassenaar 3 May 1941. A Song Thrush, *Turdus ericetorum* Turton, was banded at Hilversum 22 May 1937 as a juvenile bird and was found dead at

the same locality 30 May 1941. A Marsh Tit, *Parus palustris longirostris* Kleinschmidt, was banded 4 February 1934 at 's Graveland and was retrapped there 16 April 1936, 7 December 1936, 4 January 1938, 28 January 1938, and then trapped at Oosterhout, North Brabant 2 March 1941. A Carrion Crow, *Corvus corone* L., was banded at Hilversum 16 May 1937 and was found dead in the same month at the same locality in 1941. In 1941, in the Netherlands, 7,882 birds were banded as a result of the banding program of the Rijksmuseum. Most numerous were the Lapwings of which 1,019 were banded. Others banded in considerable numbers were as follows: Little Bittern, *Ixobrychus minutus* (L.), 106; Black-headed Gull, *Larus ridibundus* L., 321; Black Tern, *Chlidonias niger niger* (L.), 172; Song Thrush, 134; Blackbird, *Turdus merula* L., 212; Starling, *Sturnus vulgaris* L., 1,083.—D. S. F.

2. Results of Bird-Banding Activities under the Auspices of the Rijksmuseum van Natuurlijke Historie te Leiden, XXX. (Resultaten van het ringonderzoek betreffende den vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XXX.) G. C. A. Junge. 1943. *Limosa*, 16(1/2): 38-46. This is a summary of bird-banding activities for 1942. Among the interesting records is that of a Little Bittern, *Ixobrychus minutus* (L.), banded 19 June 1940 at Reeuwijk and recovered 1.5 km. from the banding locality 19 July 1942. A Herring Gull, *Larus argentatus* Pontoppidan, banded 18 July 1926 at Haamstede in the Netherlands was recovered in a trap near Antwerp 5 February 1942. Four Pied Flycatchers, *Muscicapa hypoleuca* (Pallas), including three females and one male, banded during the breeding season of 1941 at Wierden were retrapped and released during the breeding season of 1942 at the same locality. In 1942, in the Netherlands, 5,151 birds were banded. The Chaffinch, *Fringilla coelebs* L., was the most frequently banded species, 1,346 being banded during the year. Other species banded in considerable numbers are as follows: Siskin, *Carduelis spinus* (L.), 254; Linnet, *Carduelis cannabina* (L.), 254; Starling, *Sturnus vulgaris vulgaris* L., 493; Black-headed Gull, *Larus ridibundus* L., 252; and Lapwing, *Vanellus vanellus* (L.), 668.—D. S. F.

3. Results of Bird-Banding Activities under the Auspices of the Rijksmuseum van Natuurlijke Historie te Leiden, XXXI. (Resultaten van het ringonderzoek betreffende den vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XXXI.) G. C. A. Junge. 1944. *Limosa*, 17(1): 18-25. This paper summarizes the bird-banding activities for 1943. A very interesting record is that of a Honey-Buzzard, *Pernis apivorus* (L.), banded at Zeddam in the Netherlands 6 August 1932 and shot at Vällen Lake, near Upsala, Sweden, 21 August 1943. A Coot, *Fulica atra* L., banded at De Cocksdrop 12 July 1938 was recovered at the same locality 10 November 1943. A Lapwing, *Vanellus vanellus* (L.), banded at Vogelenzang in the Netherlands 11 June 1927 was shot about 25 September 1943 on the beach at Raposa, Portugal. A Short-eared Owl, *Asio flammeus* (Pontoppidan), banded 6 June 1930 at Ameland was found dead near the banding place 19 March 1943. A Song Thrush, *Turdus ericetorum* Turton, banded 16 May 1931 at Santpoort was recovered dead at Maurik, also in the Netherlands, early in November 1943. A curious record is that of a Blackbird, *Turdus merula* L., banded at Aerdenhout in the Netherlands 10 June 1942 and captured at Egersund, Norway, 11 January 1943. A Sky Lark, *Alauda arvensis* L., banded at Esschen 13 October 1931 was captured and released at Haarlem 22 June 1943. The total number of birds banded under auspices of the Rijksmuseum in 1943 in the Netherlands was 9,594. Of these, 2,356 were Starlings, *Sturnus vulgaris* L.; 1,513 were Chaffinches, *Fringilla coelebs* L.; and 778 were Linnets, *Carduelis cannabina* (L.).—D. S. F.

4. Bird-Banding by the Museum of Natural History of Göteborg in 1942. Göteborgs Naturhistoriska Museums ringmärkingar av flyttfåglar under

1942. L. A. Jägerskiöld. 1943. *Göteborgs Musei Årstryck* 1943: 69-83. During 1942 7,120 birds were banded by 56 cooperators. During 1941 there were 7,917 banded by 59 cooperators. Species banded in greatest numbers in 1942 were the Willow Warbler, *Phylloscopus trochilus* (L.), 208; Pied Flycatcher, *Muscicapa atricapilla* L., 1,118; Great Tit, *Parus major* L., 320; House Martin, *Chelidonaria urbica* (L.), 458; Sand Martin, *Clivicola riparia* (L.), 331; White Wagtail, *Motacilla alba* L., 204; Starling, *Sturnus vulgaris* L., 476; Black-headed Gull, *Larus ridibundus* L., 664. During 1942 bands were placed on 109 species. One hundred and six recoveries and returns for 1942 of birds banded in Sweden are reported. Also recoveries of five birds banded in other countries are recorded. A House Martin banded 13 July 1940 at Djupasand, Aneboda, Småland was recovered 10 km. south of the banding locality 7 July 1942. Starlings banded in Sweden were recovered in July and August in Denmark and in winter in England and Scotland.—D. S. F.

5. Bird-Banding by the Museum of Natural History of Göteborg in 1943. (Göteborgs Naturhistoriska Museums ringmärkingar av flyttfåglar under 1943.) L. A. Jägerskiöld. 1944. *Göteborgs Musei Årstryck* 1944: 73-88. In 1943 there were 7,317 birds banded by 78 cooperators. Species banded in greatest numbers were the Fieldfare, *Turdus pilaris* L., 230; Redstart, *Phoenicurus phoenicurus* L., 228; Whinchat, *Pratincola rubetra* (L.), 203; Willow Warbler, *Phylloscopus trochilus* (L.), 240; Pied Flycatcher, *Muscicapa ficedula* L., 1,073; Great Tit, *Parus major* L., 439; House Martin, *Chelidonaria urbica* (L.), 477; Swallow, *Hirundo rustica* L., 245; White Wagtail, *Motacilla alba* L., 286; and Starling, *Sturnus vulgaris* L., 589. Bands were placed on 116 species. One hundred and twenty-six recoveries and returns of birds banded in Sweden are reported for 1943. Six records of birds banded in other countries and recovered in Sweden are reported. A Song Thrush, *Turdus musicus* L., banded 20 June 1942 at Ormängen, Gränsjön, Värmland was recovered at the banding locality 4 June 1943. A Fieldfare banded at Svalnäs, Djursholm 31 May 1942 was recovered at the banding locality 16 June 1943. A House Martin banded 7 July 1942 at Myckelmåsa, Simonstorp, Östergötland was recovered 17 km. west of the banding locality 31 July 1943. A Swallow banded at Lillasäte, Höör, Skåne 8 July 1938 was retaken 7 May 1943 at 4.2 km. southwest of the banding place.—D. S. F.

6. Bird-Banding by the Museum of Natural History of Göteborg in 1944. (Göteborgs Naturhistoriska Museums ringmärkingar av flyttfåglar under 1944.) L. A. Jagerskiöld. 1945. *Göteborg Musei Årstryck* 1945: 74-89. In 1944 there were 10,104 birds banded by 89 cooperators. Bands were placed on 137 species. Among the species banded in large numbers were the Fieldfare, *Turdus pilaris* L., 551; Pied Flycatcher, *Muscicapa atricapilla* L., 1,785; Great Tit, *Parus major* L., 1,034; Sand Martin, *Clivicola riparia* (L.), 292; Swallow, *Hirundo rustica* L., 305; White Wagtail, *Motacilla alba* L., 354; Starling, *Sturnus vulgaris* L., 1,001; Lapwing, *Vanellus vanellus* (L.), 144; and Black-headed Gull, *Larus ridibundus* L., 345. Eighty-three returns and recoveries of Swedish-banded birds are recorded. A female Redstart, *Phoenicurus phoenicurus* (L.) was banded 2 km. southeast of Ed, Dalsland, 3 June 1943 and was retaken at the same place 24 June 1944. A Pied Flycatcher banded at the same locality 6 June 1943 was recovered at the banding locality 12 June 1944. A Swallow banded 23 June 1943 at Rydgoholm, Västergötland, 23 June 1943 was recovered about 10 km. from the banding locality 13 June 1944. From 1911, when bird-banding was begun, to 1944, 146,502 birds have been banded. There have been 4,380 recoveries and returns. Greatest numbers of returns and recoveries have come from the common Gull, *Larus canus* L., 1,035; and the Black-headed Gull, 1,257.—D. S. F.

7. Results of Ringing Black-headed Gulls Wintering in and Migrating through Switzerland. (Ergebnisse der Beringung in der Schweiz überwintern-

der und vorbeiziehender Lachmöwen.) Lukas Hoffman. 1945. *Der Ornithologesche Beobachter*, 42(6/7): 73-97. Based on 552 returns and recoveries of *Larus ridibundus* L., also on some 700 Gulls marked with color on wings and tails (See No. 23, Burckhardt, 1945). The Black-headed Gulls that migrate through and winter in Switzerland nest in the countries to the north and east—Sweden, Russia and Denmark being the farthest limits. Many spend the whole winter in the same place, some in a very small area, while others range throughout a city; some may fly 15 to 420 kilometers to another lake, then return shortly. Some come back year after year to the same place, as many as five years in Zürich and Geneva; others are found in entirely different localities. Fourteen Gulls were older than 10 years, three of them at least 14½ years. The greatest age for a banded Gull of this species is 25 years (Cerny, *Der Vogelzug* 1939). A splendid example of utilizing banding data.—M. M. Nice.

8. Capture of Adult Ground-Nesting Birds on the Nest for Ringing Purposes. Fr. Haverschmidt. 1946. *Dansk Ornithologisk Forenings Tidsskrift*, 40(2): 97-107. James Schenk, former director of the Royal Hungarian Ornithological Institute, showed the author his methods of capturing waders on the nest with clapnets. Although able to spend only a little time capturing birds in Holland, Fr. Haverschmidt obtained some interesting results. A Black-tailed Godwit, *Limosa limosa* (L.), caught on the nest in 1929 was taken two years later in almost the same place; another was taken three years later. A breeding Avocet, *Recurvirostra avosetta* L., captured on its nest in 1929 was found killed by a stoat beside its nest 30 kilometers from its former breeding place. Two Oystercatchers, *Haemotopus ostralegus* L., ringed in June 1930 as breeding birds on their nests, in August 1937 were found dead in the same place, killed by eating poisoned eggs. "In this bird sanctuary the Oystercatcher developed the bad habit of killing and eating the eggs and chicks of terns (*Ardea* 20: 176. 1931.) whereby they were becoming a great menace to the tern colonies." Poisoned eggs kept them in check. The author suggests that systematic ringing of all the adults and young in small settlements of terns will yield the best results.—M. M. Nice.

MIGRATION

9. Astronomy and Ornithology. William A. Rense. 1946. *Popular Astronomy*, 54(2): 1-19. In this paper the author describes how, with two observers, a recorder and two telescopes (15 to 30 power), and a small amount of other equipment, it is possible to obtain data on height of migration, average direction of migration, and density of migration. This is a tool with almost unlimited possibilities for the study of bird migration.—D. S. F.

10. The Occurrence and Migration of the Sheld Duck with Reference to Field Observations on the Gooise Coast. (Voorkomen en Trek van de Bergeend, *Tadorna tadorna* (L.), naar aanleiding van veld-observaties aan de Gooise kust.) J. Hoogerheide and W. K. Kraak. 1942. *Ardea*, 31(1/2): 1-19. Adult Sheld Ducks disappear from the area in June-July and reappear in October and November. The period of absence coincides with the molting period at which time the adults are unable to fly. Banding data show that these adult birds, together with adults from Scotland, Sweden, England, and Germany congregate in the "Deutches Bucht" area of northwestern Germany where they molt. The authors find in their data no indication of a true autumn migration in the case of the adults and assume if such does occur that it is far less important than the "migration" to the molting area. The authors are further inclined to believe that after the molt the adults return to the breeding places. The young do not "migrate" to the molting area but may show some type of true fall migration since they disappear from the coast in the fall.—D. S. F.

11. Homing of Free-living Starlings Transported away after a Year's Captivity at their Home. (Ueber das Heimfinden freilebender Stare bei Verfrachtung nach einjahriger Freiheitsentziehung am Heimatort.) Werner Rüppell und Wilhelm Schein. 1941. *Der Vogelzug*, 12(2/3): 49-56. Eleven Starlings, actually breeding or with the breeding urge, and with migratory experience, were transported 114 km. SSW and released. Six (55 percent) returned during the same spring. Fifteen young Starlings, raised in captivity and without migratory experience, were transported, after a year's captivity at their birthplace, 114 km. SSW and released. Two returned after 13 days; two others returned after 2.5 and five months respectively. Thirty free-living adults with migratory experience were transported after a year's captivity at the "home" locality, 114 km. SSW and released. Seventeen (57 percent) returned during the same spring. The first returned in three days. "Bearing in mind further consideration of the problem, the hypothesis of an action of the earth's magnetic field in distant orientation is ascribed less plausibility than the assumption that the orientation ability of migratory birds is to be attributed to an interaction, still unknown in detail, of sensory processes which are now known individually, but perhaps still unknown in the scope of their activity." (p. 56).—D. S. F.

12. Migratory Relationships of the European Goldfinch. (Zugverhältnisse des europäischen Stieglitzes, *Carduelis carduelis* (L.).) Ilse Grittner. 1941. *Der Vogelzug*, 12(2/3): 51-73. This paper is based on the analysis of 105 recoveries and returns of which 42 recoveries were at distances of more than 100 km. from a banding locality. Although considered as primarily non-migratory, at least a portion of the population is actually migratory. The migration is quite regular and in the usual southwesterly direction characteristic of migratory birds in Germany. Most of the migration appears to be to Belgium although there are recoveries also from southern France and Spain. Birds banded as adults and recovered dead had an average age of one year, three and one-half months; those banded as young and recovered dead had an average age of about one year. As a cage bird this species has been known to live as much as 15 to 19 years. One Goldfinch was recovered the day after banding about 100 km. from the banding locality. Another was recovered after six days 170 km. from the banding locality. A third traveled 260 km. in no more than 11 days.—D. S. F.

13. The Migration of the Woodcock in Russia. (Ueber den Zug der Waldschnepfe *(Scolopax rusticola)* in Russland.) H. Grote. 1941. *Der Vogelzug*, 12(2/3): 73-80. The principal migratory route is along the west coast of the Caspian Sea, lower Volga River Valley and thence along the Ural Mountains. A much less important route passes along the east coast of the Caspian Sea. There is also a migration northward in the valleys of the Dnepr and Don rivers.—D. S. F.

14. The Autumn Migration at two Places in Southern Finland and its Dependence on External Factors. (Der Herbstzug an zwei Orten in Südfinnland und seine Abhängigkeit von äusseren Faktoren.) Lars von Haartman and Göran Bergman. 1943. *Acta Zoologica Fennica* 39. 33 pp. The data on which this paper is based were gathered by means of observations at two localities, "Schärenhof von Esbo SW Helsingfors" and "Gut Lemsjöholm im Kirchspiel Askais W Åbo," mostly in September and October 1946. The paper contains a wealth of interesting observations although in general they do not allow many definite conclusions to be drawn. Except in isolated instances the authors were unable to show positive correlations between increased intensity of southward migration and cold weather *per se*. Among the exceptional cases are an instance of increased migratory density of the Siskin, *Carduelis spinus* (L.); a southward invasion of the Redpoll, *Carduelis flammea* (snow and cold weather in northern Finland); an increase in migration density of the Hooded Crow, *Corvus cornix* L.

(cold weather and snow). The authors place more emphasis on the effect of weather on migration through the operation of high and low areas and cold fronts of atmospheric pressure. Data are cited showing marked increases in the observed numbers of migrating passerine birds with the passage of a cold front. Data are presented on directions of migration including variations and anomalies thereof. —D. S. F.

15. A New Contribution to the Knowledge of the Southern Boundary of the Winter Range of German Swallows. (Ein neuer Fund zur Kenntnis der Südgrenze des Winterquartiers deutscher Rauchschwalben *(Hirundo rustica).*) E. Schüz. 1941. *Der Vogelzug*, 12(2/3): 80-82. The author discusses the circumstances concerning the recovery of a note bound to the foot of a Swallow. This note consisted of two lines, the first, "Grüsse meine teuere deutsche Heimat!" and the second, in addition to a name, "Otawi D. S. W. Afrika." If this proves to be genuine it will be the most southern record for German-banded swallows.—D. S. F.

16. The Migratory Route of the German Swallow over the Mediterranean Sea. (Zum Zugweg deutscher Rauchschwalben *(Hirundo r. rustica* L.) über das Mittelmeer in die Heimat.) R. Drost. 1942. *Der Vogelzug*, 13(3/4): 133-134. This is an interesting account of a Swallow to which was attached a note by an Italian soldier on 8 March 1942 while on the Island of Linosa (35°50′ N, 12°05′ E) south of Sicily. The bird was recovered as a breeding bird on 24 April 1942—or a few days earlier—at Teisendorf (47°32′ N, 12°49′ E) in upper Bavaria. —D. S. F.

17. The Invasions of 1942. (Von den Invasionen 1942.) R. Drost and E. Schüz. 1942. *Der Vogelzug*, 13(3/4): 140-152. The fall of 1942 was a season of invasions by more northern and northeastern species into central Europe. There was an extensive invasion of Crossbills, *Loxia curvirostra* L., southward and westward as far as the Netherlands. Considerable numbers of the Great Spotted Woodpecker, *Dryobates major* (L.), appeared in East Prussia and in smaller numbers at Helgoland, and in strikingly larger numbers than usual in the Harz Mountains. Other invaders were the Coal Tit, *Parus ater* L.; the Nutcracker, *Nucifraga caryocatactes* (L.); the Jay, *Garrulus glandarius* (L.); the Long-Tailed Tit, *Aegithalos caudatus* (L.); the Siskin, *Carduelis spinus* (L.); the Twite, *Carduelis flavirostris* (L.); the Waxwing, *Bombycilla garrulus* (L.); the Pine Grosbeak, *Pinicola enucleator* (L.); the Fieldfare, *Turdus pilaris;* the Long-Tailed Jaegar, *Stercorarius longicaudus* Vieillot; the Parasitic Jaegar, *Stercorarius parasiticus* (L.); and the Rough-legged Hawk, *Buteo lagopus* (Pontopiddan). The appearance of the last three in unusual numbers is correlated with the abundance of lemmings.—D. S. F.

18. The Fall Migration of the Swift, *Apus apus apus* L. (Zum Wegzug unserer Mauersegler *(Micropus a. apus).*) B. Hoffmann. 1943. *Der Vogelzug*, 14(2/3): 76-77. Three observations, 23 July 1915, 5 August 1942, and 11 August 1942, on the beginning or early phase of fall migraton of this Swift.—D. S. F.

PHYSIOLOGY

19. Body Temperature and Insulation in Some Finnish Birds. (Körpertemperatur und Wärmeschutz bei einigen finnischen Vögeln.) Pontus Palmgren. 1944. *Ornis Fennica*, 21(4): 99-103. Body temperatures, as measured by insertion of a thermometer in the esophagus immediately after the death of the bird, are recorded for thirteen species, all passerine except *Dryobates major* L. Highest temperatures were recorded in Crossbills, *Loxia curvirostra* L., 43.1° C. to 44.0° C.; lowest temperatures were found in *Parus cinctus* Boddaert,

34.6-39.8° C. These results are discussed in relation to body weight, total feather weight, and ratio of feather weight to body weight.—D. S. F.

20. An Apparatus for Recording the Daily Rhythm in Caged Birds. (Eine Anlage für Registrierung der Tagesrhythmik bei Käfigvögeln.) Pontus Palmgren. 1943. *Der Vogelzug*, 14(1): 12-18. This is a description of an ingenious apparatus designed to record the movements of a bird to and from, and on the perch in the cage.—D. S. F.

21. Reeds as a Source of Food for Insectivorous Birds in Winter. (Schilfrohr als Nahrungsquelle für insektenfressende Vögel im Winter.) F. Tischler. 1943. *Der Vogelzug*, 14(2/3): 69-71. The probable importance of this source of food is indicated in view of the large numbers of Lepidoptera larvae, beetles, and Diptera harbored therein.—D. S. F.

BEHAVIOR

22. The Sage Grouse Dance. E. Z. Rett. 1946. *Santa Barbara Museum of Natural History, Museum Leaflet*, 21(4-6): 39-45. This is a very interesting account of some observations made on the dance of *Centrocercus urophasianus* (Bonaparte) in Mono County, California. It contains interesting data on spacial relations relative to this phenomenon. "In the area where we worked, which was roughly one mile square, we found four strutting grounds. These places varied from a small clearing 150 feet across to the big meadow where we made most of the observations." "It was about 5:20 A.M. and he counted 108 males strutting on the meadow and there were many more in the sage brush (*Artemisia*). He estimated there were about 300 birds in sight. . . . They begin strutting when it is still dark." There is a rather detailed account of the behavior of the males during strutting. Generally the males were in the open while strutting, although at some of the smaller flats they were observed to strut in the brush. The observations concerning the behavior of the birds when the strutting was interrupted by the appearance of predators are interesting. "One morning while waiting for the sun to come up so as to get pictures, we counted 95 birds on the flat strutting and popping away. All at once all activity ceased and every bird crouched close to the ground with head extended so that each resembled a little hummock. The reason for this was a Golden Eagle (*Aquila chrysaetos*) circling above us. In a few moments all but three birds flew off into the brush-covered hills that surrounded the meadow. After about ten minutes the three birds began to strut and the others started flying back. We left at 6:45, but all the birds that were there previously had not returned. The eagles evidently get a considerable number of these grouse as we found patches of feathers all over the flat where birds had been killed." "The Morning of April 21, we arrived at the meadow at 5 o'clock. Not a Sage Grouse was in sight, but out in the flat were two Golden Eagles. As soon as we stopped the car they flew off. We went away and returned about an hour later and found twenty birds strutting. As we came in sight of the flat a coyote ran across it, and immediately all the birds crouched. As soon as the coyote ran over the hill that borders the north side of the meadow, the grouse started strutting again." During the strutting the males pay no attention to the females and vice versa. Once 95 birds were counted, of which only five were hens. Of the males only six fought, there being apparently little aggressiveness among the males during strutting. Most of the birds fly to the strutting area either singly or in small bunches from two or three to a dozen. Some walk. A flight of four miles to the strutting area was observed.—D. S. F.

23. Gull Observations in Basle. (Möwenbeobachtungen in Basel.) Dieter Burckhardt. 1944. *Der Ornithologische Beobachter*, 41(5): 49-76. Valuable study largely of Black-headed Gulls, *Larus ridibundus* L. (See No. 7, Hoffmann,

1945.) Some 700 of the birds were colored on wings and tail, the change in appearance being ignored by the other gulls. Individuals were found to be rather strictly bound by space-time relationships; most stayed in circumscribed areas throughout the day and joined and left the communal roosting places according to the degree of light. In contrast to the situation on the breeding grounds, birds did not know each other personally and *no peck order existed.* Although highly social, especially in the air, they are "distance-animals," each insisting on a certain amount of space between itself and its neighbors. Examples are given of "social-attack," which is stimulated by a certain cry, and of substitute behavior when quarreling over food or perches, while photographs show many instinctive actions, such as stretching, bathing, etc. Eight different cries are distinguished. Comparisons are made with other wintering gulls. A paper full of careful, detailed observation of behavior with stimulating discussion and interpretation.—M. M. Nice.

24. Note of Willow-Warbler. R. H. Brown. 1946. *British Birds,* 39(9): 279-280. The "queer chittering note" of *Phylloscopus t. trochilus* reported by Smith and Butlin (see reviews Nos. 14 and 15, *Bird-Banding,* 17: 173, 1946) and by Kuusisto (No. 40) was heard in the presence of a Tawny Owl *(Strix aluco sylvatica).* This would seem to correspond with the note of "fright"—*tik-tik-tik*—in the Song Sparrow.—M. M. Nice.

25. On the Territory of the Dipper in the Winter of 1943-44 on the Aare near Bern. (Ueber die Territorien der Wasseramsel, *Cinclus cinclus* (L.), im Winter 1943/44 an der Aare bei Bern.) Walter Vogt. 1944. *Der Ornithologische Beobachter,* 41(3/4): 36-43. Description of very definite territorial boundaries, with map of winter territories and discussion of behavior of these and other birds at different distances from an approaching person. The Dipper sings in winter to proclaim territory. It is not clear to the reviewer whether or not these territories are held by pairs or individuals.—M. M. Nice.

26. "Injury-Feigning" of Blackbird. G. Beven. 1946. *British Birds,* 39(8): 248. This behavior, rarely seen in *Turdus merula* L. was noted on one occasion where it saved the life of a young bird. A cat was bounding after a fledgling "when the adult male suddenly appeared, went right down in front of the cat and fluttered as if injured, just above the ground a yard or so ahead. This drew the cat off most successfully, so that the youngster reached shelter." The cat went to a bush apparently containing another young bird, whereupon "the cock swooped down at it to within an inch or so."—M. M. Nice.

27. "Anting" by Magpies. E. Reynolds. 1946. *British Birds,* 39(10): 313. Two *Pica p. pica* (L.) collected "ants in their beaks and, raising their wings, tail and breast-feathers, etc., wiped the ants under the feathers until they were well covered."—M. M. Nice.

28. Song of Female Greenfinch. I. J. F. Lees. 1946. *British Birds,* 39(8): 244. A female *Chloris ch. chloris* L. sang while standing over young. "The song was far more tuneful and far sweeter than the average Greenfinch's song and took the form of a slow, drawn-out warble, which quickened into a twitter at the end."—M. M. Nice.

LIFE HISTORY

29. The Relationship between Migration and the Breeding Biology of Birds. (Beziehung zwischen dem Zug und der Brutbiologie der Vögel.) Friedrich Kipp. 1943. *Journal für Ornithologie,* 91(1): 144-153. Of 41 species of birds which migrate relatively short distances such as to the Mediterranean region, western France, or England, 28 normally have two broods per year, eight

have two or three, and seven have only one. These species are able to spend a relatively long period in the breeding region. For birds which migrate to South Africa, however, the time spent in the breeding area is shorter and there is only one brood per season. Within each of the genera *Anthus, Motacilla, Phylloscopus,* and *Saxicola* there are numbers of both groups. The line of separation between the two groups is 20 to 22 weeks in the breeding area. Those which stay longer usually have two broods or more; those which stay less usually have a single brood. However, *Acrocephalus arundinaceus* and some other species which spend only about 20 weeks in the breeding area also have two broods. However, in these the second clutch is begun before the young of the first clutch are independent. Swallows, despite their long migration to South Africa, are able to spend 23 to 25 weeks in the breeding area and have two broods per season. In isolated instances two broods per season may occur even in a relatively short residence in the breeding area due to small clutch size. Thus Goatsuckers in about 16 weeks have two clutches of two eggs each. "We can thus propose the following *migration-breeding rule* (Zug-Bruten Regel): The period of time in breeding area and the number of broods per season are harmoniously integrated. In a period of residence in the breeding area of more than five months, as also among the permanent residents, two broods annually occur; for shorter periods, on the other hand, almost always there is a single breeding cycle per season. The relation between the period of residence in the breeding area and the number of broods appears understandable without further explanation. Much more astonishing, on the other hand, is the following fact: The clutches of the migratory birds with one brood per season shows no greater number of eggs than the clutches of the species of the same genera which have two broods per breeding season. . . . The above-established rule can therefore be extended: With a summer residence in the breeding area of less than five months there occurs only a single brood without an increase in number of eggs per clutch over that of related species with more broods. We come, therefore, to the surprising conclusion that the number of eggs and hence the number of offspring which are necessary for the maintenance of the species is, for the highly developed migratory birds, a great deal smaller, that is, about one half as great as in the cases of non-migratory species or species with short migrations." (p. 148). The author then states that the frequent assumption that migrating birds sustain greater losses is erroneous. This is explained by the assumption that the tropics and subtropics, where the birds which make long migrations spend the winter, and the migrations themselves, actually provoke smaller losses than do the rigors of the winters in the breeding areas or in nearby winter areas. As supporting evidence, the author points out the generally smaller clutches of species which breed in the tropics. These are extremely interesting ideas which in general, are well supported by the tabulated data. Certainly, in some instances at least, there are rather sweeping generalizations which might not stand up under critical examination. Nevertheless, the ideas are stimulating and deserving of careful consideration. An examination of the breeding species of the northern United States from this point of view would be of interest. The author also discusses at considerable length the *symmetry of the length of residence in the breeding area*, i.e. the ratio of time before, to the time after solstice, spent in the breeding area. Among those species, cuckoos for example, whose complete molt occurs in winter, fall migration begins closer to solstice than arrival in spring.—D. S. F.

30. On the Breeding Habits of the Snow Finch. (Ueber die Brutgewohnheiten des Schneefinken *Montifringilla n. nivalis* (L.).) E. M. Lang. 1946. *Der Ornithologische Beobachter*, 43(3): 33-43. Results of seven winters of banding Snow Finches in the Urserntal with observations on five pairs in nesting boxes. The male plays an important part in the choice of the nesting site; one was seen to slip in and out of many holes while his mate stood passively by; finally he *sang* inside of one cavity, his mate followed him and they spent a long time inside.

The female builds the nest and incubates the eggs. Six sets, measured as laid, showed no regular increase or decrease in size. The eggs out of one nest were taken as laid to see whether the bird would keep on laying; after the fourth egg the pair deserted. Before copulation the male circles singing around his mate, alighting after a gliding spiral, displaying the white secondaries, wing coverts and tail feathers. The male calls his mate off the nest during incubation; this lasts 13-14 days, not 18 as reported by others. The young increased in weight from 2.5 grams at hatching to 31.5 grams at eleven days; eyes opened at four days. Fledging takes at least fifteen days. A hand-raised bird went through bathing motions in Frau Lang's hair when it was loose; on the 24th day it made copulatory motions on people's hands, resuming this behavior at six weeks.

The averages of 224 weights were as follows: Oct. 34.5 grams (two birds); Nov. 36.5 (9); Dec. 44.7 (57); Jan. 44 (47); Feb. 42.3 (60); Mar. 41.3 (18); Apr. 36.9 (14); June 37.6 (15); July 37 (2). Snow Finches are not migratory, although they move to some extent up and down the mountains according to the weather. Although the author states there was no sex difference in weight, he did find definite difference in wing measurements, males averaging about 124 mm., females about 117. He also found that wing length increases with age.—M. M. Nice.

31. The Magpie in the Sempach Lake Region. (Aus dem Leben der Elster im Sempacherseegebiet.) Jak. Huber. 1944. *Der Ornithologische Beobachter*, 41(1/2): 1-7. In 1926 *Pica pica* (L.) was a rare bird in the Sempach Lake region; now it has much increased. In winter Magpies roost together in willows and alders by the lake and fly six to seven kilometers to their feeding grounds. By the end of February pairs take up their territories; both birds build covered breeding nests and sleeping nests, often in the same or neighboring trees, but occasionally as far apart as 400 meters; the male does most of the work on the sleeping nest. First sets ordinarily contain six to eight eggs, but in four years when cockchafers (June bugs) were abundant some contained eight to ten eggs.—M. M. Nice.

32. Contribution to the Knowledge of the Breeding Biology of the Nuthatch. (Beitrag zur Kenntnis der Brutbiologie des Kleibers *(Sitta europaea caesia).*) J. Bussmann. 1943. *Der Ornithologische Beobachter*, 40(5/6): 57-67. Many measurements are given of the growth of feathers, bill, etc., and changes in weight of the six young Nuthatches. Weight increased from three grams on the second day to 25-27 on the 16th day, then decreased to 23-24 grams on the 22nd day. Eyes opened at nine to twelve days. Feeding was recorded by the terragraph with the following results: 4th day 166 trips, 6th 255, 8th 263, 11th 215, 12th 287, 14th 263, 16th 276, 18th 353, 20th 335, 22nd 270. At many trips astonishing numbers of caterpillars, spiders, flies, and moths were brought; once the male carried eight caterpillars at once. The long fledging period (usually 24 days) is accompanied by more brooding than with most small passerines; on the 4th day the female was spending half the daylight hours on the nest, and on the 8th about a fifth, while brooding continued to some extent until the 20th day. At night she brooded until the 19th day. Sixteen days after leaving the nest the family were still together. A small boy helped the author by getting the young out of the cavity and back again; the parents stationed themselves on a limb over the boy, knocked pieces of moss and bark on top of him and finally flew to his head and pecked him.—M. M. Nice.

33. Contribution to the Breeding Biology of the Nuthatch. (Beitrag zur Kenntnis der Brutbiologie des Kleibers, *Sitta europaea caesia.)* J. Bussmann. 1946. *Der Ornithologische Beobachter*, 43(1): 1-5. Description and sketches of the plastering of the entrance and inside of a nest box by a female Nuthatch; she also carried in nesting material, while her mate proclaimed territory and

occasionally fed her. The nine eggs were incubated by the female and hatched in fourteen days.—M. M. Nice.

34. Do Juvenile Birds Survive Less Well than Adults? David Lack. 1946. *British Birds*, 39(9): 258-265. Farner *(The Wilson Bulletin*, 57: 58. 1945) in calculating longevity and life expectancy of the American Robin, *Turdus migratorius migratorius* (L.), based the calculations on the first November 1 of the bird's life. This date was selected in order to allow the banded juvenile and immature birds to become dispersed and hence avoid possible bias in the sample because of higher rate of recovery in the neighborhood of banding stations. The banding data themselves, although without statistical reliability, suggested that this might be true. Life expectancy as thus calculated was then approximately the same (1.2-1.3 years) for each November 1 of the bird's life. Lack *(British Birds*, 36: 166-175. 1943) had used August 1 as the initial date for his calculations of life expectancy for *Turdus merula* L. In using this date he found a lower expectancy of 1.6 years on the first August 1 than the expectancy of 1.9 years which he found for the second August 1 and the third August 1. Farner in comparing this with the constant life expectancy in the American Robin on each 1 November suggested the possibility that the lower expectancy calculated by Lack for the first August 1 might be due to a sample biased by a higher rate of recovery among undispersed banded juvenile and immature birds. In this paper Lack presents the results of a re-examination of his data on the Blackbird as well as other species in order to test this suggestion. His data show quite convincingly that the lower expectancy on the first August 1 is genuine and not due to a disproportionate sample. It is due apparently to a higher death rate during this period. This death rate declines to almost a normal adult death rate by 1 November and becomes the same as the normal adult death rate by 1 January. The author suggests that future studies of similar nature base the calculations on the first January 1 of the bird's life as was done by Kraak, Rinkel and Hoogerheide *(Ardea*, 29: 151-175. 1940.) in their studies on the Lapwing, *Vanellus vanellus* (L.). The reviewer heartily approves of this suggestion. It should be pointed out for those who may wish to read this paper in its entirety that a typographical error has occurred in Table III. The third column should be headed, "On second Aug. 1st of life." This is noted in *British Birds*, 39(10): 320.—D. S. F.

35. The Fourteen-Year Stork Colony at Rossitten. (Vierzehn Jahre Storchsiedlung Rossitten.) E. Schüz. 1943. *Der Vogelzug*, 14(2/3): 90-109. The Kurische Nehrung in East Prussia is unfavorable for the White Stork although conditions are suitable at Rossitten. There is a record of a breeding pair in 1905 followed a lapse until 1930 when new colonization occurred. This paper is based on observations and banding studies conducted on this colony from 1930 through 1943. The observations involve about 60 pairs. Storks appear in the area of their birthplace exceptionally during the first year, occasionally during the second, but usually not until the third. The youngest breeding storks at Rossitten were third-year birds. One pair remained intact for three years. Return to the same nest site for three consecutive years was observed in five individuals; one returned five times. Return to the area, but not to the same nesting site, was observed four times, with a break, in one instance and possibly seven in another.—D. S. F.

36. The Breeding of Marsh and Montagu's Harriers in North Wales. A. W. Colling and E. B. Brown. 1946. *British Birds*, 39(8): 233-243. *Circus aeruginosus aeruginosus* (L.) had not bred in North Wales since 1877; in 1945 a pair (neither of which was fully mature) hatched four young the last week in June, but raised only one. The male did all the hunting for the family, dropping the prey to the female on the ground; the male would land at the nest, but leave in a few seconds, while his mate remained and prepared the food. She was molting heavily and was not seen to visit the nest after July 28, although she remained

in the vicinity until Aug. 6. The male now delivered the prey directly to the young. Moorhens, *Gallinula chloropus* (L.), young pheasants and rabbits were the chief items of food. The first flight of the young bird was seen Aug. 11; on the 22nd it caught in mid-air prey dropped by its father.

Montagu's Harrier, *Circus pyargus* (L.) had not been known to breed in Wales since 1900; on June 23 a nest with three young about 10-14 days old was found. Besides the parents there was another male in normal adult plumage that "seemed to share the 'territory' of the nesting pair, and was tolerated by both male and female even in the vicinity of the nest," yet he was never seen catching prey. The male hunted for the family; he "never settled at the nest, but was generally met in the air by the female. Food exchange occurred mostly by dropping, but sometimes the prey was passed from foot to foot." Three young were raised.—M. M. Nice.

37. Preliminary Observations on a Colony of Reed-Warblers. Philip E. Brown. 1946. *British Birds*, 39(10): 290-308. Two seasons' work with *Acrocephalus scirpaceus scirpaceus* (Hermann) in a reed-bed in Lincolnshire. Table III shows the approximate area of territories of nine cock birds watched in June 1946; one decreased from 448 square yards to 285, another from 344 to 110, three were lost "to intruding cocks," while one increased from 170 to 440 yards. The author does not tell how he distinguished individual birds, nor male and female, yet from the details given, one would think colored bands or colored feathers necessary. Considerable interference was found between adjoining cocks, and unmated males sometimes won territory and mate away from the original bird, even after egg-laying had started. Although the unpaired male builds a "cock nest," usually a mere platform, all the building of the real nest seems to be done by the female. "The spells on the eggs of the males averaged seven minutes with a maximum of 12½; of the hens, 11½ minutes, with a maximum of 26." Sometimes birds "stripped" their nests, using the material for new nests, usually within ten yards. Photographs are given of a male coming to the nest during a thunderstorm and sheltering his incubating mate.—M. M. Nice.

38. Pete, Our Pet Baltimore Oriole. Mrs. F. W. Pugsley. 1946. *News from the Bird-Banders*, 21: 32-36. A hand-raised female *Icterus galbula* (L.) was a "fine songster with a voice softer than that of the male." She sang a typical oriole song, singing mostly in early spring. Towards the last of April she showed migration-restlessness for about three weeks, whirring her wings rapidly, running along her perch and "uttering at intervals a shrill call that we never heard before; her eyes were wide open, but she was not conscious of our presence, in fact did not see us!" This she did each spring and for a few days each fall, feeding up beforehand for the "journey." She paid no attention to wild male orioles; "but about the time the orioles were building their nests," she would gather and weave material, but never shaped a nest. Each June she shed her long toe-nails, then grew them again, apparently an adaptation for safe brooding of nestlings.—M. M. Nice.

ECOLOGY

39. The Importance of Ecologic Fixation in Faunistic Investigations. (Die Bedeutung der oekologischen Beharrungstendenz für faunistische Untersuchungen.) Josef Pietzmeier. 1942. *Journal für Ornithologie*, 90(3/4): 311-322. This interesting paper is based primarily on an investigation of the Song Thrush, *Turdus viscivorus viscivorus* (L.), in the Münster area of northwestern Germany. This species was not uncommon in this region before 1900, but then disappeared completely. In 1928 it reappeared, and thereafter gradually increased in density as a breeding bird. Ecologic observations revealed it to be primarily a species of deciduous trees. In mixed forests, it was found also to prefer deciduous trees.

Also it was found to show a distinct preference for the edge of forest and, even more so, for groves and small groups of deciduous trees. It is even described by the author as a bird of the meadows. In order to ascertain the origin of the birds of the Münster area the author examined the ecologic characteristics of the populations in adjacent areas. All surrounding populations were found to be primarily coniferous-forest birds or otherwise ecologically unrelated to the recently established Münster-area population. An exception is the population of northern France which is ecologically identical to that of the Münster area. An examination of the literature reveals that there has been a gradual eastward expansion of this ecologic population-type through Belgium, Holland, northern Rhineland, and northwestern Westphalia. This expansion had been proceeding for about 20 years. The author regards this example as evidence for a *rule of ecologic fixation.* Other examples are cited and the question is raised as to the possibility that ecologically ubiquitous species may in reality consist of several ecologically fixed populations.—D. S. F.

40. Studies on the Ecology and Daily Rhythm of the Northern Willow Warbler. (Studien über die Oekologie und Tagesrhytmik von *Phylloscopus trochilus acredula* (L.).) Päivio Kuusisto. 1941. *Acta Zoologica Fennica,* 31. 120 pp. This doctor's thesis, published after the death of the author in battle, is an elaborate study extended over several years. The Willow Warbler is an exceedingly abundant territory-holder in central Finland, frequenting particularly the birches that are rich in insect food suited to its needs (pp. 66-166). Activities at several nests at Savonlinna were studied with the help of a recording instrument, described and illustrated. Nest building lasts four to five days, the female working hard at first, little later; egg laying took place very regularly between 3 and 4 o'clock A.M. At this high latitude (62° N) the beginning and ending of daily activities show no definite relation to light; in June there must be only some two hours of "darkness," civil twilight occurring at about 11 and 1 and sunrise about 2:30.

During incubation time spent in sleep by three females amounted to 4, 6, 6¾ hours with one bird, 3, 5, 6, 6, 6½ with another, while with a third eight records ranged between 7 and 9½ hours; the last two were incubating at the same time (diag. 10). Some females left the nest several times during the night. Diagram 12 gives the incomplete record of incubation at one nest from the 5th to 9th days; activity lasted 15¼, 15¼, 15, 16 and 18 hours; on the 6th, 7th and 8th days the bird left the nest 30, 27, 27 times, on the 9th something over 35. Length of periods on this subject in *Bird-Banding,* 17: 173, October 1946; also No. 24 in this minutes off the nest. The young are fed in the nest for 14 days, the number of meals increasing up to the age of eight and nine days. On two days near the beginning there were some 150 feedings, at eight to ten days all day records at three different nests amounted to 356, 404 and 524 feedings; while three near the end of the period came to 295, 333, and 589. Two complete records of the whole period reached 3300 and 5000 feedings. Unfortunately in none of these cases is the number of young mentioned. The amount of time at night spent in the nest by brooding females ranged between 4 hours 20 minutes to 6 hours 32 minutes with six individuals. The special note aroused by the presence of a Cuckoo is mentioned (p. 66). (See articles by Smith and Butlin Nos. 14 and 15, on this subject in *Bird-Banding,* 17: 173, October 1946; also No. 24 in this issue.) A detailed study was made of the available insects in conifers and hardwoods and the decision reached that the Willow Warbler has greatly benefited from the increase of the latter due to man's activities. A fine study, yet to my mind, there are too many charts and too few tables and not as many definite facts as could be wished.—M. M. Nice.

41. The Turnstone in its Relationship to the Environment. (Der Steinwälzer, *Arenaria i. interpres* (L.) in seiner Beziehung zur Umwelt.) Göran

Bergman. 1946. *Acta Zoologica Fennica*, 47. 144 pp. A most interesting, thorough behavior study with constant references to recent European studies on other shorebirds. Ten pairs (some of them color-banded) were observed for six seasons on the outer reefs 15-25 kilometers west of Helsingfors; of ten banded breeding birds nine returned the following summer and seven the next. Of 64 banded young one male returned to breed. Anatomically the Turnstone is adapted to bare flats in contrast to the Redshank, *Tringa totanus totanus* L., that weighs about the same (110 grams) and lives in the grassy parts of the same islands; measurements and X-ray pictures of young show that the legs are much shorter, the claws much sharper and stronger in the former than the latter.

Pairs on the outer reefs nested earlier than those on inner reefs, despite higher temperatures in the latter regions; the author's explanation is that the character of the breeding grounds on the inner reefs is not as satisfactory a releaser in regard to the inborn pattern as that of the outer reefs. Incubation in seven cases lasted 23 days, in two 24 days and in one 26-27. Temperatures in the nest increased from 30°-31° C. during early stages to 38°-40.6° C. in late stages. Of 112 eggs in 28 sets 81 hatched (72.3 percent) and 66 young were fledged (58.9 percent). Two color-banded pairs held the same territories three years in succession. Eye-sight in deep twilight is far better than that of gulls and terns. Turnstones bathe in fresh water, not salt. Territory is defended by a special threatening attitude that may end in pursuit and fighting; females do not defend territory much until after the young hatch. Copulation is incited by all sorts of disturbances—rivals, predators, etc. The female usually incubates from sunrise until about 3-5 P.M., the male the rest of the time.

The male's interest in the nest greatly increases during incubation, as is shown by the relative distance he stands while "keeping watch."

The first sight of the young always releases hovering in the parent. Young start to peck when a little over an hour old, first pecking at all objects; when 8-12 hours old they peck mostly at moving objects, from three days only at moving objects. Freezing at parental warning starts before hatching, and well feathered young will freeze at the warning note of the male upon the approach of a person. Adults react with hovering upon the crying of the young or their quick approach during the first two weeks, but 17-20 day young are repulsed. Short flights are possible at 19 days, full flights at 24-26. Young orient themselves to parents more by sound than sight; adults never go to a crying chick, but call it to them; Redshanks go to their chicks. For the first week both parents care equally for the young, but after that the female gradually takes over territory defense while the male cares for the chicks. Females leave in July, males and young in early August.

Sets of Turnstone and Redshank were exchanged and hatched at the same time; the Redshank adults were excited by the calls of their newly hatched young in the Turnstone nest; the Redshank young answered them, yet stayed with their foster parents and the next day ignored the calls of their real parents. All went smoothly until the chicks were twelve days old, when the female Turnstone pecked one; it screamed and the male came to hover it. The adult Turnstones did not respond to the notes of their young, hatched by the Redshanks; the latter raised the foster young successfully, but began to show some antagonism when they were eleven days old.

Turnstones usually nest in colonies of the Common Tern, *Sterna hirundo* L. and Arctic Tern, *Sterna macrura* Naumann, more rarely in gull colonies, but never in large ones. They react to the alarm notes of all the Laridae and also of the Redshank. The terns never serve as species-companions, but the Ringed Plover, *Charadrius hiaticula* L., and Northern Dunlin, *Erolia alpina alpina* (L.), do; these are driven off territories, but associated with during migration; all three are about the same size and it may be that the white wing band serves as a releaser for social flight.

If a crow flies over a Turnstone's nest, the parent immediately leaves with a loud note and the nest is robbed; in tern colonies, however, the Turnstone is warned beforehand and leaves its nest without betraying its whereabouts. Terns leave their nests and attack a passing crow, while gulls hurry back to their eggs. Turnstones often attack gulls and also Starlings, possibly because of their crow-like color; they never attack terns. Some Turnstones eat the eggs of terns and gulls with no particular reaction from their victims. "The behavior of the gulls and terns to the Turnstone is a good example of how slight is the response of these birds, when a bird whose appearance does not make the impression of an enemy either through an inborn pattern or through conditioning, robs their nests and remains in their midst," p. 122.

Very interesting experiments were made with cardboard models; models larger or smaller than Turnstones and those of miscellaneous shapes were ignored, as were discs without "heads" or eyes; head and neck coloring proved more important than body coloring. Males attacked male models, attacked and tried to copulate with female models; females attacked female models and one tried to copulate with such a model, thus showing sexual ambivalency. Crow models induced alarm cries and attacks from the gulls and terns and a White Wagtail, *Motacilla alba* L., strong alarm from Redshanks and Chaffinch, *Fringilla coelebs* L., and mild alarm from the Turnstones. The terns even attacked the model of a crow's head that was moved back and forth across the observation tent. A notable paper.—M. M. Nice.

42. Changes in Ecology and Return to the Previous Breeding Place or Birthplace by the Barred Warbler. . (Beständsänderung und Heimattreue bei der Sperbergrasmücke *(Sylvia nisoria)*. M. Posingis. 1942. *Der Vogelzug*, 13(3/4): 155-156. These observations were made on the Kurische Haff by the light-house keeper at Windenburg. In 1925 Barred Warblers were common among the blackberry bushes, *Rubus caesius* L. During the ensuing years the area was used as pasture for cattle and the blackberry as well as the Barred Warblers almost disappeared. With the reappearance of the brush the birds again became common. In 1942, 25 singing males were noted in a stretch of 500 meters. Of special interest are the records of the return of four of 60 Barred Warblers banded as young to their birthplaces and the return of five of 28 banded adults to the previous breeding place.—D. S. F.

CENSUSES AND POPULATIONS

43. The Index of Heron Population, 1945. W. B. Alexander, with supplementary note entitled **"The Balance of Population in the Heron"** by David Lack. 1946. *British Birds*, 39(7): 201-206. The nineteenth year of this study of heron populations again bears out Alexander's contention that the population (as indicated by number of nests counted in rookeries) shows a sharp decline in the spring following a severe winter. Although the temperature in England and Wales again dropped to the danger level, 33° F., during the past winter, the period was too brief to affect the population as a whole. But in eastern England where the cold period was most severe the index fell off from 108 in 1944 to 91 in 1945. In Lack's provocative discussion of the heron population data he rightly points out that the most interesting finding is not the decrease following each severe winter but the rapidity with which a reduced population returns to normal but fails to maintain that same rate of increase once the normal population level is reached. This phenomenon he refers to one of the density-dependent mortality (or reproductive) factors discussed by Nicholson *(Journal of Animal Ecology*, 2: 132-178. 1933), and states that "One may suppose that the Heron population is primarily controlled by a mortality factor . . ." Lack concludes that food shortage is the most likely cause. A shortage due to direct com-

petition seems unlikely in good years with mild winters. Surely it would be equally probable that the limiting factor may be influencing reproduction rather than mortality. If true this would present another example of what Leopold has termed *saturation point (Game Management*, Chas. Scribners Sons, 1936).—Wm. H. Elder.

44. Determination of Bird Densities in Winter. (Vogelbestandsaufnahmen im Winter.) Pontus Palmgren. 1943. *Ornis Fennica*, 20(4): 94-98. The author by a linear census-method studied the winter populations of birds in the forest of the region around Helsingfors. Although the data are expressed primarily in terms of numbers per species per 10 kilometers travelled by the investigator, they probably indicate a density for all species of 105 individuals per square kilometer (about 42 per acre) in early winter and 60 per square kilometer (about 24 per acre) in late winter. Densities in West Lappland were much lower, 15-20 individuals per square kilometer (about 6-8 per acre).—D. S. F.

45. The Changes in Relative Numbers of the White-Fronted Goose and the Bean Goose. (Ueber Aenderung im Zahlenverhältnis von Blässgans *(Anser albifrons)* und Saatgans *(Anser fabalis).*) Hardenack von Viereck. 1943. *Der Vogelzug*, 14(2/3): 71-73. Since 1880 and even since 1924 there has been a marked increase in the numbers of the White-fronted Goose and a corresponding decrease in the Bean Goose as migrant birds in East Prussia. The Bean Goose is now regarded as a rare bird whereas in 1880 Hartert regarded the White-fronted Goose as rare.—D. S. F.

CONSERVATION

46. Maori and Mutton-Bird. L. E. Richdale. 1946. Dunedin, N. Z., *Otago Daily Times*. 16 pp. 2/6. Another of Mr. Richdale's splendid "Wild Life" series, all of which, with their delightfully written summaries of his researches on the life histories of New Zealand birds and with their fine photographs, should be most successful in arousing public interest. This one concerns *Puffinus griseus* (Gmelin), which is familiar to many of us on Atlantic crossings as it courses over the waves. "The New Zealand Mutton-bird, or Sooty Shearwater, as it is known in other countries, is probably the commonest sea-bird in this part of the globe, if not in the whole world. It has been roughly estimated that some twenty million birds are in existence." "The nightly home-coming of countless numbers of petrels on these bird islands of New Zealand, and elsewhere, is one of the marvels of the world, to be experienced by only a few privileged ones of the human race." The main points in the life history are given (for details see *Condor*, May, 1944 and March 1945) and the complicated methods of capture and preparation of the young by "birders" described, some young being "taken annually for food by those Maoris who hold ancestral rights."—M. M. Nice.

47. The Scientist Outside the Laboratory. Harlow Shapley. 1946. *American Scholar*, 15: 411-415. That most people are blind to the absolute dependence of human life on soil, plants and other animals is only too evident; it is, however, shocking to find a prominent scientist proposing in a scholarly journal that we should: "Invent inexpensive methods for the transformation into effective fuel and palatable foods of the now worthless brush and scrub timber, which covers much of New England and other wilderness regions. In other words solve the major problems of botanical waste." Prof. Shapley needs to learn the fundamentals of biology and ecology; I would recommend to him No. 57 in these reviews and "Conservation of Natural Resources," University of Pennsylvania, 1941—M. M. Nice.

GEOGRAPHIC DISTRIBUTION AND ZOOGEOGRAPHY

48. The Mockingbird in Iowa. Warren N. Keck. 1946. *Iowa Bird Life*, 16(2): 23-27. The Mockingbird, *Mimus polyglottos polyglottos* (L.), has been observed in 51 counties in Iowa; there are breeding records for 22 counties. There are no records from the north central counties suggesting either that this species has followed the main waterways, the Missouri and Mississippi rivers northward, or that the more recently glaciated region of north central Iowa is less favorable to the species.—D. S. F.

49. The Biogeography of the East Indies—The Greater Soenda Islands. I. (Biogéographie de l'Insulinde: les Grandes îles de la Sonde (I).) J. Berlioz. 1942. *Compte Rendus sommaire de Seances de Societé de Biogéographie*, 1942: 19-85. This paper contains a brief summary of the geologic history of Malaya in which it is shown that the present geographic features date from the Tertiary. Two influences can be detected in the modern fauna. One is very old and is derived from the fauna of the ancient Malayan continent. The more recent appears to be the result of a gradual extension into Malaya of the Asiatic fauna. These elements occur in indirect proportion to the distance from the Asiatic continent. The author recognizes four faunal provinces in the Indo-Malayan Region. The *Malayan Province* includes the Malay Peninsula and the adjacent islands. It is the richest of the provinces in number of species. The *Sumatran Province* includes Sumatra, Banka, Billiton and other adjacent islands. The *Borneo Province* includes Borneo and adjacent islands. It has many characteristics in common with the Malayan and Sumatran provinces. Absence of certain forms and the presence of certain specialized forms indicate an earlier isolation of this province. The *Java Province* includes Java, Madoera, Bali and other adjacent islands. The number of species is slightly decreased but with more endemic forms. There are some Australo-Papuan elements. There is a general discussion of the faunal characteristics of Sumatra.—D. S. F.

50. Bird Notes from Fawcett, Alberta. Bernard W. Baker and Lawrence H. Walkinshaw. 1946. *The Canadian Field-Naturalist*, 60(1): 5-10. These notes are based on observations made between 19 May and 2 June 1942. There is an annotated list of species observed and a table giving the number of each observed. Many of the notes concern observations on nests and eggs.—D. S. F.

51. Preliminary Report of the Birds and Mammals of Glacier National Park, British Columbia. J. A. Munro. 1945. *The Canadian Field-Naturalist*, 59(6): 175-190. This paper contains a description of the physiography and life zones of the area in addition to the annotated list of 65 species of birds.—D. S. F.

52. Birds on Tinian in the Marianas. Theodore Downs. 1946. *Transactions of the Kansas Academy of Science*, 49(1): 87-106. This paper consists of notes on fifteen species based on observations made by the author during a period of military duty, 31 May to 17 October 1945, on Tinian.—D. S. F.

BOOKS

53. Bird Migration. (Vogeltrek.) G. J. van Oordt. 1943. E. J. Brill. Leiden, The Netherlands. 145 pp. This is a revision of the treatise on bird migration published under the same title by the author in 1936. It includes information from the American and British literatures through November 1941 and April 1940 respectively and from other literatures up to 1 March 1943. In considering the migration of birds the author indicates that there must be likewise a consideration of periodic movements of other groups of animals. Consequently

in the introduction attention is devoted to migration of other animals with particular attention to salmon. Bird migration is defined as follows (p. 4): "Under bird migration we understand then the movement of certain species of birds from the breeding area to the winter area and the return from the winter area to the breeding area. Bird migration is a definitely oriented and periodic phenomenon; all other movements accomplished by birds do not fall into the concept of migration." The introduction also contains reviews of some of the more or less generally known facts about migration in the northern hemisphere, migration in the southern hemisphere, and migration in the tropics. Attention is also given to invasions from the south and the ecologic relation between the breeding area and the winter area. There is a brief discussion of the possible origin of bird migration based mostly on the treatment of this subject by Thomson (*Problems of Bird Migration*, H. F. and G. Witherby, London. 1926) and by Mayr and Meise (Theoretisches zur Geshichte des Vogelzuges. *Der Vogelzug*, 1: 149-172. 1930). The remainder of the book is divided into a descriptive part and a theoretical part.

One chapter in the descriptive part is used to review the observed physical details of migration with emphasis on the situation in the Netherlands. A section is devoted to winter invasions by more northern species. The discussion of broad-front and narrow-front migration is concluded (p. 48) as follows: "So we can thus see that a broad front is the rule for most species of birds and that only in a few cases is a narrow front followed." Material on altitude and speed of migration is summarized. Also there is a review of the literature which shows the tendency of birds to return annually to the same breeding area and that which shows the use of the same winter area. Although there are some evidences indicating the use of the same migratory route in successive seasons, the opinion of Drost (Zieht der einzelne Vogel stets auf demselben Weg? *Ardea*, 30: 215-223. 1941) that this seldom occurs is cited. Ten pages of the descriptive part are used in the presentation of data concerning the influence of meteorologic phenomena. In general this deals with the relations of temperature, clouds, rain, and snow. With the exception of the citing of Schenk (Die Prognose des Frühjahrzuges der Waldschnepfe in Ungarn. *Proc. 7th Int. Ornith. Congress*, Amsterdam, pp. 357-365, 1931) concerning the influence of low pressure areas on the migration of the European Woodcock, *Scolopax rusticola* L., there is no discussion of the rather promising field of the influence on bird migration of high and low pressure areas and the movements of air masses. The first portion of the theoretical part is given to a discussion of migratory instinct *(het trekinstinct)*. This is in many respects the most interesting part of the book. It is a brief but careful and scholarly consideration of the data available at the present time. After a consideration of such external influences as changes in temperature and changes in light as the causes of migration the author draws the following conclusion (p. 96): "The more one considers the migration problem the more one comes to the conclusion that changes in external conditions have no influence on the development of the migration instinct and only can have a subordinate influence on the finding of expression in migratory movements." This is further amplified as follows (p. 97): "Migratory birds come periodically into migratory disposition and only then when there is migratory disposition can external factors bring the inclination to migrate." Further, "Migratory movements are thus the expression of a periodically returning instinct; this last can prevail over other instincts." The development of the migratory instinct can be influenced not only by external factors but also internal factors such as hormones. Attention is given to the possible roles of thyroxin and sex hormones. In neither case is there conclusive evidence. As a matter of fact there is an increasing body of evidence indicating that sex hormones have little or no effect on migration. Among this evidence are the observations of apparently normal migration by castrated birds. The author very rightfully points out that the field of the endocrine physiology of migration is one in which there is much controversy and in which many experiments appear

contradictory. Many data are difficult to interpret properly because the experiments have been performed on caged birds, thus creating abnormal conditions.

The final chapter of the theoretical part of this book is devoted to the problem of orientation in migration. This involves a consideration of most of the classical experiments. The possibility of the young learning the migratory route from the adults, the author believes, must be discounted in many species. Results of experiments on migration by young birds lead the author to suggest (p. 116) "that all young migratory birds possess an inherent 'sense of direction' ["richtingzin"]. If we use this word ["richtingzin"] we must bear in mind that with this term nothing is explained, but only a faculty is proposed, of which we know only the result." In his concluding pages the author points out the important contributions to the details of migration which remain to be made by banding studies, although these studies will, of course, contribute little to our knowledge of the physiology of migration. Field ornithology can contribute much to our knowledge of the effect of meteorologic phenomena and other external influences on migration. There are ten pages of very useful bibliography. This book is a scholarly and well integrated treatise on migration despite its brevity and despite the tendency towards emphasis on conditions in the Netherlands. It is heartily commended to all students of bird migration.—D. S. F.

54. Glossary of European Birds. (Glossarium Europae Avium.) Harriet I. Jørgensen and Cecil I. Blackburne. 1941. Ejnar Munksgaard. Copenhagen. 10 kroner (about $2.25). This remarkable little book contains the common names for the species of European birds in seventeen languages. The organization is tabular with an alphabetic arrangement by genera. Under each scientific name (binomials only) the common name, whenever such exists, is given successively in Czech, Danish, German, English, Spanish, French, Icelandic, Italian, Magyar, Dutch, Norwegian, Polish, Portuguese, Russian, Finnish, Swedish, and Turkish. In ornithology common names are used much more extensively than in the other branches of zoology both because of the greater standardization of common names and because of the greater numbers of amateurs who participate in ornithological research and publication. It seems highly probable that the important initial step in the achievement of international understanding will have to occur among the scientists for it is among scientists that there is already a common basis for understanding. Because of the large number of ornithologists, both amateur and professional, ornithology offers one of the best fields for the development of international understanding and cooperation. The publication of this book, despite the fact that it appeared during some of the darkest days in history, marks an important stride toward a broader internationalism in ornithology. The authors, the publisher, and the Rask-Oersted Fund, which gave financial assistance, are to be commended.—D. S. F.

55. The Breeding Birds of Denmark with Special Reference to Changes During the Last Century. Poul Jesperson. 1946. Einar Munksgaard, Copenhagen. 19 pp. 6 kroner (about $1.35). This little book, published by the Danish Section of the International Committee for Bird Preservation, may be regarded as a general inventory of the breeding species of Denmark with an accounting of recent trends in abundance. The basic portion of this book is an annotated list of 217 species and subspecies known to, or suspected to breed or to have bred in Denmark. Principal annotations deal with changes in abundance and distribution. Thirty of the species in this list are of uncertain status. Ten species have with certainty become extinct as breeding birds in Denmark during the 19th and 20th century. There is little chance that they will ever reestablish themselves as breeding birds. These include the Roller, *Coracias garrulus garrulus* L.; Hoopoe, *Upupa epops epops* L.; Eagle-owl, *Bubo bubo bubo* (L.); Short-toed Eagle, *Circaëtus gallicus gallicus* (Gmelin); Sea Eagle, *Haliaetus albicilla* (L.); the Kite, *Milvus milvus milvus* (L.); the Osprey, *Pandion haliaetus*

haliaetus (L.); the Common Crane, *Grus grus grus* (L.); the Great Snipe, *Capella media* (Latham); and the Caspian Tern, *Hydroprogne tschegrava* (Lepechin). In addition there is a list of 17 species including, among others, the White Stork, *Ciconia ciconia ciconia* (L.), which have decreased markedly in numbers in the last half century. Principal factors in extinction and decline in numbers have been the activities of hunters and collectors, drainage of lakes and marshes, modern methods of forestry, cultivation of moors, and climatologic changes. At least twelve species have become firmly entrenched as breeding species in the latter part of the 19th century and even during the early part of the 20th century. Principal factors in these immigrations are believed to be changes in climate and the development of fir plantations. Most of these species have come from the south; eight of the twelve are passerine. In addition there are seven species which have arrived and become established recently. These are the Bullfinch, *Pyrrhula pyrrhula* (L.), 1916, probably from northern Germany; Grey Wagtail, *Motacilla cinerea cinerea* Tunstall, 1923, probably from Germany; Wigeon, *Anas penelope* (L.), 1926, possibly derived from liberated and "half-tame birds"; Red-crested Pochard, *Netta rufina* (Pallas), 1940, "presumably an immigrant from North Germany"; Tufted Duck, *Aythya fuligula* (L.), 1905, "presumably coming from Sweden"; Lesser Black-backed Gull, *Larus fuscus* (L.), 1925; and the Kittiwake, *Rissa tridactyla tridactyla* (L.), 1941. The introduced Pheasant, *Phasianus colchicus* (L.), has become established well. The House Sparrow, *Passer domesticus domesticus* (L.), has increased in general despite a decrease in the larger cities. The Starling, *Sturnus vulgaris vulgaris* (L.), has likewise increased in the last one hundred years. Interesting also is the change in biotope of the Blackbird, *Turdus merula merula* (L.), formerly a distinct forest bird, "now numerous in gardens and parks." Although not mentioned in this book, it seems likely that the intrusion of southern species is to be correlated with the maritimization of the Baltic climate which began in the middle to latter part of the 19th century; this has been discussed extensively by Scandinavian authors in recent years.—D. S. F.

56. The Life of the Hummingbirds. (La Vie des Colibris.) J. Berlioz. 1944. Histoires Naturelles 4, Gallimard, Paris. 198 pp. 90 francs. This is a charming non-technical book written for the layman by the world's foremost authority on hummingbirds. The author shows himself to be one of those rare individuals who, as a leading authority and specialist, can still portray his specialty in a manner that should captivate the interest of all. The opening chapter in which the general characteristics of the family are discussed is followed by an interesting chapter on locomotion. Of interest are the data on rapidity of wing beat in the humming birds (20 to 50 beats per second) as compared to a sphynx moth (72 per second) and to Diptera and Hymenoptera (80 to 190 per second). The third chapter discusses food and feeding and the corresponding adaptations of hummingbirds for the procurement of nectar and for small arthropods from flowers. The following chapter, an account of reproduction and nidification, is accompanied by excellent photographs. The second part of the book, entitled "The Hummingbirds in Nature," contains chapters on habitats and on distribution and migration.—D. S. F.

57. Report on Activities of the Conservation Section; Division of Agricultural Cooperation; Pan American Union (1943-1946). L. S. Rowe, Director. 1946. Pan American Union. Washington, D. C. 148 pp. This masterly volume, largely the work of William Vogt, includes reports on surveys of México, Guatemala, Chile and Venezuela, the longest section (pp. 28-111) being devoted to Mexican Natural Resources—Their Past, Present and Future. "Especial attention should be called to the thesis that generally, in Latin America, there is a dangerous degeneration of land from areas of valuable land-use capability to areas that approximate the unproductiveness, in every sense,

of the desert. This tendency can be fully understood only in terms of the dynamic and functional concept of renewable resources, and by recognizing that these resources *must be considered in their totality*, as part of an almost infinitely complex organic structure," (p. 1.). An appalling picture is given of land abuse, becoming steadily worse with the ever-increasing population. "It is probably no exaggeration to say that from 75 to 90 percent of Latin America's land area is unsuitable for cultivation, except with such practices as are now almost nonexistent. It is also no exaggeration to say that México, Central America, and South America altogether form a vanishing continent," (p. 21.).

In reports on the possible guano resources of México and Chile, brief accounts are given of the chief guano birds of the West Coast, and exceedingly interesting, but all too brief, references to their sociology and behavior; for instance guanays or White-breasted Cormorants, *Phalacrocorax bougainvillii* (Lesson) need to nest in great colonies because of their communal fishing habits. Seven-year population cycles are mentioned, and the basic importance of protection from man, and the dangers of indiscriminate destruction of natural enemies are stressed. An impressive and challenging work that deserves the widest circulation.—M. M. Nice.

58. A Naturalist on Lindisfarne. Richard Perry. 1946. Drummond, London. 248 pp. 15s. This attractive little volume with its handsome photographs of Holy Island off the coast of Northumberland, its history of the human inhabitants, of visiting naturalists and of the birds, with its bibliography, indices and map, represents a great deal of research in old records and a great deal of observation by the author (1090 days in 7½ years) on the island itself, where the weather is often bad, but the birds are breath-taking. The greater part of the book is devoted to the author's own experiences: Through the Seasons, Birds of Passage (here the effects of wind and fog on migration are discussed at some length), Wading Birds, Wildfowl and Seaducks, Seafowl, Fulmar Petrels. Mr. Perry writes with vividness, originality and at times much beauty. For example, he is speaking of "a cloud of Godwit": "no sooner has this great concourse gathered together on the spit, than its individuals are impelled by a common and irresistible excitement, at so vast a gathering of their kind, to give free rein to that supreme expression of all their moods—Flight; and five thousand of them, rising as one, go whirling out over the tumultuous ocean; changing direction, soaring, stooping, with a hardly credible, spontaneous swiftness; splitting into separate flights, coalescing once again, weaving farther out over the sea, until lost to sight in the blown spray's mist that ever hangs over this storm-bound coast."—M. M. Nice.

59. Birds of the Philippines. Jean Delacour and Ernst Mayr, with line drawings by Earl L. Poole and Alexander Seidel. 1946. The Macmillan Company, New York. xv + 309 pp. $3.75. Although a member of the *Pacific World Series* published under the auspices of the American Committee for International Wild Life Protection, this book is, in general organization and method of treatment, a companion volume to Dr. Mayr's "Birds of the Southwest Pacific" (The Macmillan Company, 1945). There has not been a thorough treatise of Philippine birds since R. C. McGregor's "Manual of Philippine Birds" (1909-1911), which is now exceedingly rare. "The Birds of the Philippine Islands" (1931-1935) by the Marquess Hachisuka has been completed only through the first two volumes. The primary purpose of the *Pacific World Series* was to foster a greater understanding of natural history among the members of our armed services and consequently to further the desire to conserve and protect the wild life of the Pacific world. Unfortunately, from this standpoint, this volume in its appearance one year after the cessation of hostilities is late for such purposes. Otherwise, fortunately it provides a much needed treatise of Philippine birds, suitable for field work, and which will be useful for many years to come. The systematic section was prepared independently by families by the two authors,

33 having been prepared by Mr. Delacour and 26 by Dr. Mayr. Reciprocal reading and checking by the authors have given the book a thorough uniformity. Since McGregor employed only binomial nomenclature, considerable revisions have been necessary in order to conform with the more modern concept of the species. Because of the preference of the authors for large genera there has been extensive lumping, especially as compared to Hachisuka's volumes. (See Delacour and Mayr, 1945, Notes on the taxonomy of birds of the Philippines. *Zoologica*, 30: 105-117. Review in *Bird-Banding*, 17(2): 95-96.) Nine pages are devoted to "Bird Geography in the Philippines" in which are recognized an Eastern Province consisting of Luzon, Mindanao, and surrounding islands; and a Central Province including the more western islands from Tablas to Negros and Cebu. In addition, three marginal districts are recognized. These are the Mindoro District, the Luzon Strait or Northern District, and the Sulu District. The brief section on bird habitats in the Philippines and the ecologic notes contained in the discussions of individual species in the systematic section contribute much to the value of the book. Common names, often adopted from McGregor, are given for each species. Keys to genera and species are included in the systematic section under most of the families.—D. S. F.

60. The Birds of Northern Thailand. H. G. Deignan. 1945. *U. S. National Museum Bulletin* 186. 616 pp. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., $1.25. The area encompassed by this treatise includes "Chiang Rain Province and those parts of the provinces of Mae Hong Son, Chiang Mai, Lamphun, Lampang, Phrae, and Nan lying north of latitude 17°47′ N." This important monograph is the product of four years' collecting by the author during his residence in Siam in addition to a most careful and scholarly consideration of the collections and publications of other ornithological investigators in northern Siam, including Gyldenstope, Eisenhofer, Hugh McCormick Smith, and de Schauensee. The introductory material includes a review of previous ornithological work concerning the area, discussion of geography, physiography, climate, breeding seasons, migration, faunistics, and vegetation. The annotated list, extending from page 28 to page 572, gives synonymy, notes on abundance, ecologic and other biologic observations for each of the species and subspecies.—D. S. F.

61. Monograph of the Shrikes of the Genus Lanius. (Monographie des Pies-Grièches du genre Lanius.) Georges Olivier. 1944. Lecerf, Rouen. 326 pp. This monograph is the product of a type of research, the study of a natural group throughout its entire range, which has much to contribute to modern ornithology. The first part consists of 58 pages in which the general characters of the family Laniidae and genus Lanius are discussed. Also are included a section on classification and a phylogenetic diagram. The second part is a systematic treatment of the genus in which four groups are recognized: (1) A primitive group containing *cristatus, isabellinus, tigrinus, collurio, gubernator, collurioides.* and *vittatus.* These occur as breeding birds primarily in Europe and Asia. (2) The *excubitor* group containing *bucephalus, excubitor, sphenocercus,* and *ludovicianus.* This group breeds in North America, Europe, Asia, and Africa. (3) The *Indomalayan group* contains *minor* and *schach* and breeds as a group from New Guinea through Eurasia to the Atlantic. (4) *African group* consisting of *excubitorius, cabanisi, collaris, newtoni, mackinnoni, dorsalis, nubicus, senator,* and *souzae.* These species occur in Africa and southern Europe. For each species or subspecies there is a list of synonyms; a list of published illustrations; descriptions of adults and young; characteristics for field identification; geographic distribution; description of nest, eggs, and reproductive habits; habits and feeding habits. A noteworthy monograph under any conditions, its appearance during the darkest days of recent French history makes it even more remarkable. The value of this treatise is much enhanced by numerous maps and several plates, nine of which are excellently colored. There are seventeen pages of bibliography.—D. S. F.

62. Insect Dietary. Charles T. Brues. 1946. Harvard University Press, Cambridge, Massachusetts. xxvi + 466 pp. $5.00. This is a charming and readable book, its text excellently permeated with a wealth of well-chosen and interesting examples. The author estimates that the actual number of species of insects is probably in the neighborhood of ten million. An important factor in the ability of this group of animals to produce such a prodigious number of species and correspondingly tremendous numbers of individuals is the enormous variation in food habits and utilizable foods. Treatment of the vegetarian insects is accomplished in three chapters dealing respectively with herbivorous insects, gall insects, and those which feed on fungi and other microorganisms or enter into symbiotic relations with them. Four chapters are devoted to the carnivorous insects. There is a chapter in which predatory insects are discussed and a brief chapter is devoted to parasitism in general followed by separate discussions of endoparasites and ectoparasites. The chapter on ectoparasites is of particular interest to ornithologists because of the information which it contains on Mallophaga, Hippoboscidae, and other parasites of birds including a discussion of the relation of ectoparasites to avian systematics. The final chapter, one which may seem to be out of place in such a book, deals with insects as food for other organisms. This is of interest to ornithologists not only because of the material and discussions concerning the consumption of insects by birds but because it also provides a comparison of the insectivorous activities of various groups of animals. Each chapter is concluded with a classified list of references. This is a most commendable contribution to the literature of the science of biology.—D. S. F.

63. A Naturalist's Scrapbook. Thomas Barbour. 1946. Harvard University Press. x + 218 pp., 20 pls. $3.00. Fourth in a series of well-known previous *operae minori* by the same author, *A Naturalist's Scrapbook* arouses the attention of the reader from cover to cover. This book contains a widely scattered sum of subjects, like a gossipy account of how T. B. outwitted many competitors in obtaining precious, or unique specimens for his Museum; descriptions of far-away lands, mostly islands, that he loved so much; an interesting discussion of the principal problems of biogeography, etc. Here and there, the bossy personality of the author, very subtly expressed in phrases like the following, comes out, "The Museum in Boston [of the Boston Society of Natural History] is, I believe, destined to be a museum devoted to public entertainment and instruction, especially of young people, *a glorified and most honorable adjunct to the public school system*, as well as a center for popular adult education in science" (italics are the author's). Then, the coming and going of Barbour's daughters, like a *leit-motif* in the soft cadence of the book.

Quite a considerable amount of information on the early and formative periods of the Museum of Comparative Zoölogy, at Harvard College, is contained in the initial chapters. A consideration of several zoological problems, in an attractive form, follows, interspersed with personal reminiscences of Barbour's experiences in the islands of the Malay Archipelago and the Caribbean lands. The chapter entitled "Two Pleasant Memories" is certainly worth reading, showing as it does the literary talent of the writer much better than others. Finally, "A Retrospect" of some family connections says more of Barbour's somewhat complicated psychology as a leader of social affairs, a scientist and a museum executive than the rest of his book.

Only one slight correction, concerning the date of arrival of Louis Agassiz in the United States. Barbour says in two or three occasions (p. 18 *et al.*) that Agassiz came to this country in 1847. A revision of his biography indicates that he arrived in New York in the month of October 1846. Outside of this minor mistake, *A Naturalist's Scrapbook* is a wonderful piece of entertainment in parazoological literature, that may well fill a Sunday afternoon with the reading of the lively adventures of a man who described himself as "a frank and unashamed packrat."—Manuel Maldonado-Koerdell.

64. Birds in Kansas. Arthur L. Goodrich, Jr. 1946. *Report of the Kansas State Board of Agriculture* June, 1945, 64: 1-340, 6 col. pls., 169 figs. "Birds in Kansas" is one of a series of publications issued by the State Board of Agriculture intended to acquaint residents with the fauna and flora of their state. From the standpoint of the value of such a work to the layman, and especially to the school children of Kansas, this book is definitely meritorious. Any publication informing the public about the lives of living organisms is to be welcomed, provided the information it presents is accurate. However, to the reviewer it seems a pity that so much money was spent in publishing this work without an attempt having been made in its preparation to bring to light a considerable body of *new* facts concerning the birdlife of this interesting midwestern state. To have done this would have made "Birds in Kansas" useful to layman and ornithologist alike, both in and outside of Kansas. One searches in vain for dates of arrival and departure for migratory species, for definite nesting records, and for notes on behavior and life history of birds in Kansas. For each of several rare species, we are told only that the bird in question is a "straggler"; no actual record is given, nor even the season in which it has been known to appear in the state. For example, the Caspian Tern is listed on page 209 with a brief description, a statement of general range, the derivations of the specific and subspecific names, and the statement that this tern "is the largest of its type." We are told, in conclusion, that "though relatively common along the sea coasts and at its nesting grounds, the Caspian tern is probably quite out of its own in Kansas, and rare indeed within our borders." The reviewer wondered, and still would be wondering, if the late W. S. Long's "Check-List of Kansas Birds" (*Trans. Kansas Acad. Sci.*, 43: 433-456, 1940.) were not at hand, if there is a *bona fide* record for the species for the state.

Information that would have enhanced the value of the book was readily available, some of it probably in the author's own files, and certainly much of it in excellent collections of Kansas birds in the state's institutions of higher learning, which collections apparently were not consulted to any great extent. It seems hardly fitting also that a 340-paged book dealing with the birds of Kansas omits mention of such outstanding names in Kansas ornithology as C. D. Bunker, J. M. Linsdale, G. C. Rinker, and A. Wetmore and that only passing reference is made to N. S. Goss and F. H. Snow. Even the brief citation on page 7 to Long's "Check-List" is both incomplete and incorrect. The book is without a bibliography.

The book may not have been intended for advanced and serious students of ornithology. Yet, it appears to have been as evidenced by the author's frequent excursions into avian nomenclature and systematics, including even an indirect reprimand (p. 215) of the A.O.U. Committee on Nomenclature wherein he is wholly in error.

Outline drawings by L. A. Fuertes are used profusely throughout the text. However, the artist intended that these be used only for students to color and not as bird portraits. Since the book was distributed freely to Kansas schools, this aim of the artist still may be fulfilled.—G. H. Lowery, Jr.

CORRECTION

M. P. Géroudet, editor of Nos Oiseaux, calls attention to an error in the review of his paper 'Le fuligule nyroca dans la région de Genève.' This review, which appeared in *Bird-Banding*, 16, no. 1, 1945, p. 45, states that "The author has noted the tendency of this species [*Nyroca nyroca*] . . . to be found in flocks with the Tufted Ducks (*Nyroca fuligula* (L.)" but should read . . . in flocks of Common Pochards (*Nyroca ferina* (L.)).

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